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Operations in the Cobalt District, Ontario

Ore Carrying from 1000 to 8000 Oz. Silver per Ton Mined from Narrow Veins; Product Shipped out for Smelting; Growth of the Camp

BY EDWIN HIGGINS

Cobalt lies in the northeastern part of Coleman township, in the Province of Ontario. It is distant about 330 miles northerly from Toronto, and may be reached by an overnight trip from that city over the Temiskaming & Northern Ontario Railway, a road built and operated by the Canadian government. Cobalt has a population of about 6000, and the town, or camp, stretches along the northwestern shore of Cobalt lake. The chief producing mines of the district lie within 2½ miles of the town. The elevation of Cobalt lake is 968 ft. above sea level.

To those familiar with the mining districts in the western part of the United States, the Cobalt district presents a most striking contrast. Unlike many of the western mining camps where bleak hills and little or no water is the rule, the Cobalt district is well covered with vegetation and timber; the country for many miles around is plentifully supplied with water in the form of rivers, smaller streams and innumerable lakes. The surface presents an uneven appearance, hills with steep faces often rising to a hight of 100 ft. or more.

Geology

There are in and around the Cobalt district a great variety of Pre-Cambrian rocks; also prominent outcrops of the Niagara of the Silurian. Between the Niagara and the Pleistocene there are no formations represented in the district. The oldest series of the district are the Keewatin and Laurentian. The Keewatin is an igneous complex, consisting of greenstones, quartz porphyries and other rocks. It has been more or less folded and disturbed. The Keewatin is cut through by a medium- to coarse-grained granite to which the name Laurentian is applied. The Keewatin rocks, however, were folded before the intrusion of the Laurentian.

After the Laurentian intrusion, the surface was subjected to erosion for a long period and these rocks, together with the Keewatin, were worn down. The oldest fragmental material that lies directly on the eroded Keewatin and Laurentian surface, consists of conglomerates, graywack-slate and impure quartzites. These rocks contain fragments of the granite, greenstone and other representatives of the older series. This formation, the Lower Huronian, contains most of the cobalt-silver veins.

The veins cut through all these series, but the most productive are usually in the rocks which contain more or less coarse fragments. It is believed that the fissures now occupied by these veins were produced at the time of the eruption of the younger, post-Middle Huronian diabases. The Lower Huronian probably has a thickness of at least 500 ft. in some cases. Being laid down on an uneven surface, its depth at different points is quite variable. The Middle Huronian is represented in the series of arkoses, together with conglomerates and quartzites, of the township of Lorraine.

The post-Middle Huronian diabase occupies a large part of the surface of the area. In most cases, where associated with the Huronian, these rocks seem to

RIGHT-OF-WAY SHAFT NEAR RAILWAY TRACKS; SILVER QUEEN IN BACKGROUND

occur in the form of sheets or sills, spreading between or over the layers of the rocks through which they cut. After the eruption of these diabases, whose exact age is not known, erosion of the surface again took place for a long period of time and all the series now exposed in the field, with the exception of the younger Niagara, were worn down. Much of the surface of the area is occupied by boulder clay and loose bedded deposits.

Veins

Most of the cobalt-silver veins occur in the Lower Huronian. Several have been found in the diabase and in the Keewatin. Most of the Keewatin rocks are tougher and do not fracture with the same ease as the overlying series of the Lower Huronian; hence the solutions have not had the same freedom of movement in the former as in the latter. Insofar as the precipitation effects which the rocks of either series may have on solutions working through fissures in them, there seems to be little difference between the two. Many of the pebbles and boulders and much of the cement material in the Lower Huronian, have been derived from the underlying Keewatin. Hence one would think they would have about the same influence in precipitating substances from solution, as the rocks in the latter formation.

The more important veins so far found in the Lower Huronian lie in what may be called two parallel belts. Although these two belts have a strike approximately northeast and southwest, this direction is not maintained throughout. The veins on the Trethewey and Coniagas strike east and west. The main veins on the La Rose and McKinley-Darragh strike approximately northeast and southwest, while that in the northwest corner of the Nipissing location, on the southeastern border of lake Cobalt, strikes northwest and southeast. The vein in the southwest corner of this location strikes east and west, which is the direction of strike of the majority of the veins. The veins vary in width from 1 to 14 in., the majority being not over 6 in. in width. In some cases there occurs what may be called a system of veins, three or four roughly parallel fissures sometimes making a mineralized width of about 20 to 30 in. The veins usually stand practically vertical. There are examples of veins that run from the Huronian conglomerate into the underlying Keewatin; there are veins *e. g.*, one on the Lawson property, that run horizontally from the Keewatin into the diabase; the Nova Scotia vein runs downward from the Keewatin into the underlying diabase.

The Ores

The more important ores in the veins are native silver (associated with which is usually some dyscrasite, argentite, pyrargyrite and other compounds of the metal), smaltite, niccolite and related minerals. Many of the minerals are intermixed in the ores, and for this reason some of them have not been clearly identified. Calcite forms the chief gangue, but some of the veins contain only a small amount of this material. Quartz and fragments of wall rock are often found intermixed with the ores. The minerals making up the vein filling have, in all likelihood, been deposited from highly heated and impure water which circulated through the cracks and fissures of the crust and were probably associated with the post-Middle Huronian diabase eruption. It is rather difficult to predicate the original source of the metals—silver, cobalt, nickel, arsenic and others. They may have come up from a considerable depth with the waters, or they may have been leached out of what are now the folded and disturbed greenstones and other rocks of the Keewatin.

Discovery and Growth of the Camp

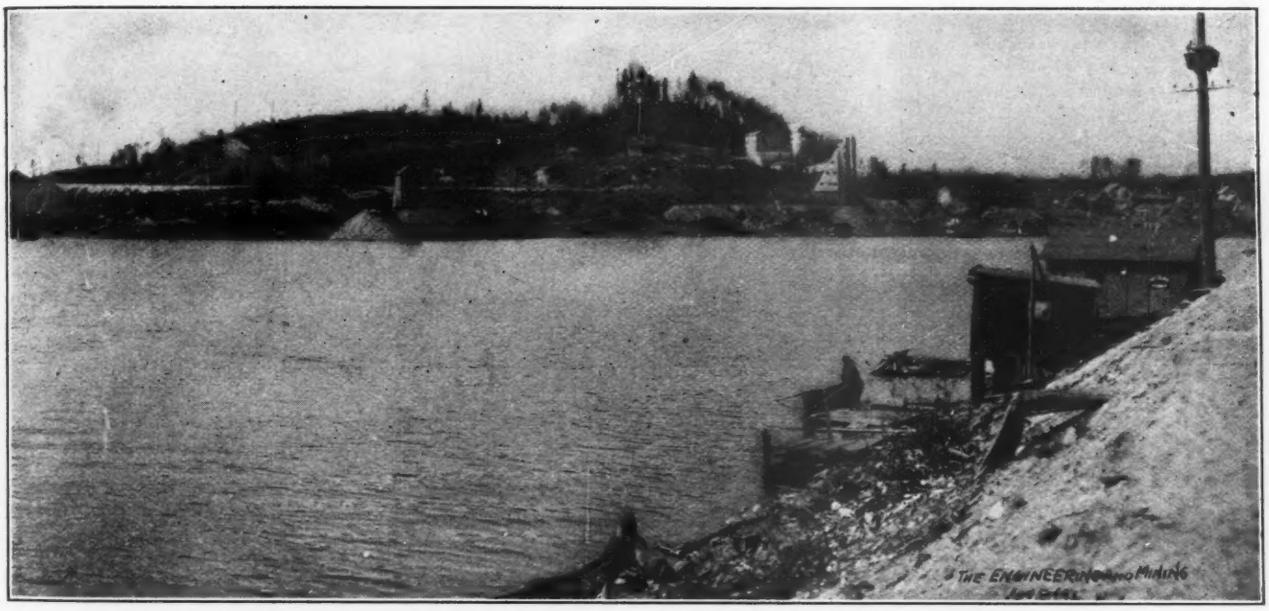
Cobalt's growth, since its discovery a few years ago, has been remarkable. The first discovery of mineral was made on Aug. 15, 1903, during the building of the Temiskaming & Northern Ontario railway, on what is now the McKinley-Darragh property; the second discovery was made Sept. 15 of the same year, on the La Rose property. These discoveries, however, aroused little interest, and it was not until October, when a sample of the mineral was given to T. W. Gibson, director of the Bureau of Mines of Ontario, that outside attention was directed to the discovery. Mr. Gibson recognized the mineral as niccolite, and forwarded it to Willet G. Miller, provincial geologist. Mr. Miller immediately visited and examined the district, and published his first report in November, 1903. For some reason, probably the failure of previous mining booms in other districts, little enthusiasm was awakened until 18 months later, when the public began to learn of the rich shipments of ore being made from the Cobalt district. The real rush of prospectors and investors began about the middle of 1905. Since that time the progress made has been almost without parallel. In 1908 the mines had been developed to such an extent that Cobalt supplied nearly 9 per cent. of the world's production of silver. The principal shippers during 1908 were Nipissing, La Rose, Coniagas, O'Brien, Kerr

LOOKING NORTH ON COBALT LAKE—RIGHT-OF-WAY MINE ON THE RIGHT

Lake, Trethewey, Silver Queen, Temiskaming & Hudson Bay, Townsite, Right of Way and Crown Reserve; in addition to these there were about 30 other properties from which varying tonnages of ore were shipped. Several shippers have been added to the list in the present year. The accompanying table, compiled from different reliable sources, will give an idea of the growth of the Cobalt district since 1904. Up to the second quarter of 1909, over $10,000,000 had been paid in dividends by Cobalt silver mines. Among these, Nipissing, La Rose, Temiskaming & Hudson Bay, Crown Reserve and Kerr Lake furnished a large percentage of the total.

SILVER PRODUCTION OF COBALT COMPARED WITH OUTPUT OF THE UNITED STATES AND THE WORLD.

	Production of Cobalt District.				Silver Production of United States.		Silver Production of the World, Ounces.
	Producing Mines.	Ore Shipments, Tons of 2000 lb.	Silver Contents, Ounces.	Commercial Value.	Ounces.	Commercial Value.	
1904	5	159	206,875	$111,887	57,786,100	$33,515,938	182,262,336
1905	17	2,336	2,451,356	1,360,503	56,101,600	33,858,438	181,267,583
1906	19	5,837	5,401,766	3,667,551	56,517,900	37,748,757	182,738,896
1907	29	14,851	10,023,311	6,155,391	56,514,700	37,299,699	183,386,268
1908	0	25,362	17,000,000	8,200,000	51,798,053	27,382,640	200,655,384



LOOKING SOUTH ON COBALT LAKE—MCKINLEY-DARRAGH MINE AND MILL TO RIGHT OF HIGHEST POINT OF HILL; PART OF DUMP OF NIPISSING MINE SHOWS ON EXTREME LEFT

Mining

In the early days of the camp all of the ore was won by open-cut mining. At present the bulk of the ore is mined through vertical shafts with levels at various intervals; open-cut operations, however, are still to be found on a few of the properties.

Following are the approximate depths attained by some of the more important operations: Nipissing, 200 ft.; LaRose, 325; Crown Reserve, 200; Temiskaming, 300; Kerr Lake, 425; Cobalt Central, 400; Coniagas, 150; Buffalo, 200; Trethewey, 175; Temiskaming & Hudson Bay, 225; O'Brien, 300; Chambers-Ferland, 150; McKinley-Darragh, 250; Townsite, 100; City of Cobalt, 175; Right-of-Way, 180; Nancy Helen, 175; Nova Scotia, 350; Silver Queen, 175.

Owing to the fact that the silver ore is not confined entirely to the narrow veins, but is found more or less disseminated in the wall rock on either side, no attempt is made to mine the vein matter separately. Everything is shot down to a stoping width and sent to the surface.

The practice of picking and cobbing is general in the camp. As carried on at several of the mines, the practice is as follows: The ore is dumped from the skip onto a coarse grizzly or screen, the material passing through being sent to the concentrator, although in some cases it is rich enough for shipment to the smelter. All overs from the grizzly pass slowly down a slightly inclined bumping table. Before starting on its course down the table the rock is washed by means of a spray of water, this process enabling the pickers, who stand on either side of the table, to more readily recognize the rich ore. High-grade ore is picked out and sacked for shipment; mixed pieces are also picked out, the lean portion cobbed, and the resulting high-grade ore sacked for shipment. All material passing over the table goes to the concentrator. This practice is varied in certain minor details at some of the mines.

Concentration

In the concentration of the ore the general practice is to crush to from 20- to 30-mesh, following this by classification and treatment on various tables and slimers. The average concentration is about 40 into 1. The variations in arrangement depend on the nature of the ore to be treated. The Buffalo concentrator reduces its ores with crusher and rolls, sizes in trommels and sends the different sizes to five jigs. A Chilean mill is used instead of stamps. Sands are treated on four Deister tables, while the slimes go to Callow settlers; the overflow from the settlers goes to a cyanide plant, the remaining material being treated on three Deister slimers.

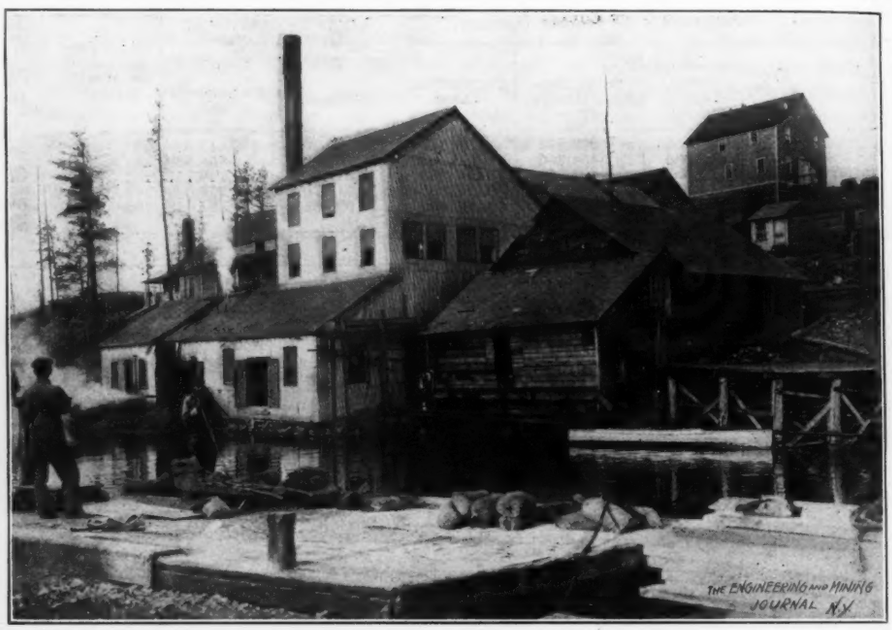
At the Coniagas concentrator the rock is broken in crushers and rolls and fed to three trommels. The ⅜- and ¾-in. sizes are jigged, the undersize going to a classifier. The overflow from the classifier goes to a settling tank, the material from which is treated on a Frue vanner. The sands from the classifier are treated on a Wilfley table. Thirty stamps are used here.

The Nipissing Reduction Company's concentrator crushes to ½ in. and reduces the rock to 16-mesh through rolls. The material is then sized to 16-mesh, which goes to a Wilfley table; 40-mesh, which goes to a James table; 90-mesh, which also goes to a James table; and slimes, which are treated on a James slimer.

The following seven concentrators are now in operation at Cobalt: Buffalo,

capacity 80 tons; Cobalt Central, 100 tons; Coniagas, 125 tons; King Edward, 40 tons; McKinley-Darragh, 80 tons; Northern Customs Concentrator, 80 tons; Nipissing Reduction Company, 80 tons. The capacity of the Northern Customs Concentrator will soon be increased to 120 tons. The New O'Brien concentrator will probably be completed before the end of July; its capacity will be 120 tons. The Colonial Mining Company is building a concentrator; this is expected to be completed in August. The Temiskaming & Hudson Bay company will also erect a concentrator.

ORIGINAL DISCOVERY ON LA ROSE



NIPISSING CONCENTRATOR ON EDGE OF COBALT LAKE

PRINCESS MINE OF LA ROSE COMPANY

LA ROSE SHAFT AND PART OF DUMP

Output and Value of the Ore

As may be noted in the accompanying table, the production of the Cobalt mines was 25,362 short tons in 1908. This output is greater than the combined production of the four previous years. Some idea of the probable production in 1909 may be gained from the statement of shipments during different periods up to the present time. The following shipments were made during the week ending on the dates stated: Feb. 27, 1,056,490 lb.; March 20, 1,182,360 lb.; April 17, 1,197,513 lb.; May 1, 1,013,196 lb.; May 29, 1,078,978 lb. Unless the production increases or decreases appreciably, the output for 1909 will probably be between 26,000 and 28,000 tons, a slight increase over that of 1908. The chances are that the above estimate will prove too low. The average silver content of the ore shipped during 1908 was 725 oz. per ton. This compares with 677 oz. in 1907, and 1013 oz. in 1906.

Smelting

Most of the low-grade ore of the camp, which contains from 100 to 150 oz. silver per ton, goes to the Denver, Colo., plant of the American Smelting and Refining Company. The high-grade ore, which carries as high as 8000 oz. silver per ton (average from 2000 to 2500 oz.) is treated principally at the Deloro Mining and Reduction Company's works, at Deloro, Ont., and at the Canadian Copper Company's smeltery at Copper Cliff, Ont. In addition to the plants mentioned above, ore is shipped to the following works: American Smelting and Refining Company, Perth Amboy, N. J.; Balbach Smelting and Refining Company, Newark, N. J.; Pennsylvania Smelting Company, Carnegie, Penn.; United States Metal and Refining Company, Chrome, N. J.; Consolidated Mining and Smelting Company, Trail, B. C.; Coniagas Reduction Company, of Canada, Thorold, Ont.; Beer, Sondheimer Company, Hamburg, Germany; Anglo-French Nickel Company, Swansea, Wales.

Treatment charges vary from $7 to as high as $40 per ton, depending entirely on the grade of the ore and, in some cases, on the content of cobalt, arsenic and nickel. The Canadian Copper Company and the Deloro Mining and Reduction Company pay for over 6 per cent. cobalt in the ore, provided, however, that the nickel content is lower than the cobalt. The Anglo-French Nickel Company pays for cobalt on a sliding scale, the price ranging from 35c. for 8 per cent. to 55c. per lb. for 16 per cent. and over. Nickel is not paid for, its presence being considered detrimental. Although the arsenic in the ore is saved and marketed in the form of white arsenic by several smelters, few, if any of them, allow anything for the arsenic present in the ore.

CHAMBERS-FERLAND MINE ON LEFT; O'BRIEN MINE ON RIGHT

AT KERR LAKE—LAWSON SHAFT TO LEFT, CROWN RESERVE ON EDGE OF LAKE, KERR LAKE NO. 7 TO RIGHT

Labor, Power and Costs

Labor at Cobalt is made up of Canadians, some Frenchmen from the lower province, Italians and a few Americans and Finns. There is no set wage scale. The union scale of wages is as follows: Drillers, $3.50 per day; helpers, $3; muckers, $2.75; surface men, $2.50; shaft work, 25c. advance. A small proportion of the miners are union men, and the wages in general may be said to be about 15 per cent. less than the above figures.

The cost of producing silver varies greatly. The average, however, may be said to be between 9 and 10c. per ounce.

The boiler plants of the Cobalt district represent a total of approximately 10,000 horsepower; there are over 60 compressors, with a maximum capacity of about 40,000 cu.ft. of free air per minute. The cost of power is, approximately, $125 per horsepower-year. On the completion of the two power plants now building on the Montreal river, it is expected that the cost of power will be reduced to at least $75 per horsepower-year. The plant at Hound Shoot will furnish electrical power, while that at Ragged Shoot will furnish compressed air. The compressed-air plant will utilize the Taylor system, by which pressure is secured without moving machinery. This system is fully described in the JOURNAL of Jan. 19, 1907, page 125.

The geology of the Cobalt district has been fully and ably covered by Willet G. Miller, provincial geologist of Ontario, and appears in Vol. XVI, Part 2, of the report of the Bureau of Mines, 1907. I have quoted freely from Mr. Miller's report in the part of this article dealing with the geology of the district. The balance of the notes were gathered on a recent brief vist to Cobalt.

Carbon Dioxide in Producer Gas

Bulletin No. 30, on "The Rate of Formation of Carbon Dioxide in Gas Producers," by Dr. J. K. Clement, L. H. Adams and Dr. C. N. Haskins, has just been issued by the Engineering Experiment Station of the University of Illinois.

The problem attacked by the writers of this bulletin was the determination, so far as possible, of the factors that govern the production of carbon dioxide in gas producers. The chemical reaction expressed by the equation

$$C + CO_2 = 2\,CO,$$

which is fundamental in the action of the gas producer, was studied and a differential equation for the reaction-velocity derived. From this equation the velocity constants and the equilibrium constant were calculated from observed values of the percentage of CO formed in given time intervals. The rates of variation of these constants with the temperature were determined, and these were found to agree with van't Hoff's laws. From the constants thus determined it becomes possible to calculate the percentage of CO formed for any time of contact of carbon and CO_2 and at any temperature.

In the experiments performed, CO_2 gas

was passed through a porcelain tube filled with either charcoal, coal, or coke and heated in an electric furnace. The time of contact could be varied at will and by changing the current a temperature range from 700 deg. to 1300 deg. C., was obtained. Analyses were made by the Hempel method, both CO_2 and CO being absorbed.

It was found that the production of CO formed depends upon (1) the temperature, and (2) the time of contact of gas and carbon. With ordinary depth of fuel bed a high percentage of CO requires a high temperature—1300 deg. C. or above.

In an appendix, Dr. Charles N. Haskins has given a method solving the reaction-velocity equation and has established a criterion for the applicability of the general differential equation to the reaction under investigation. He has also shown that the same general method of solution may be applied to various other types of equations of reaction-velocity.

Slag Granulation and Explosions

By Richard Hutchinson

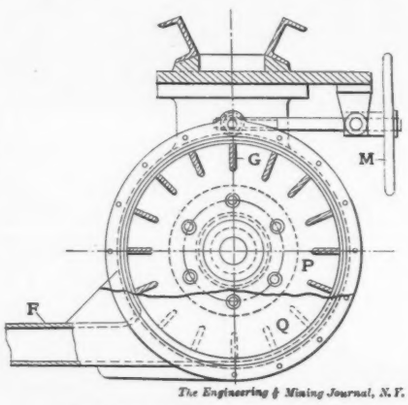
If a thin stream of molten furnace slag is poured into cold water the slag breaks into small pieces. This operation, termed granulation, is due to the small thermal conductivity of the slag. When the slags are not clean but contain small quantities of metal, speiss or matte they may cause an explosion when poured into water. It is well known that when molten lead is poured into wet molds an explosion will occur that scatters the hot lead in all directions; it is not, however, so well known that molten copper will float the water and not cause an explosion when treated in the same manner.

At first my opinion was that the phenomenon was due to latent heat; but since the latent heat of copper is 43 calories and that of lead 5.37 calories, it is evident that if this were the only cause the copper should create the greater explosion. The next assumption was that latent heat and thermal conductivity were both involved, but this theory was not entirely satisfactory, from the fact that if copper is allowed to fall 12 or 15 ft. and strike on a wet iron floor it too will explode, whereas it will not explode in a wet mold. I, therefore, settled on the theory that since all bodies cool from the interior outward, and only chill on the exterior when they have lost a quantity of heat, the phenomenon must be due to the thermal conductivity of the metals.

If the thermal conductivity of silver is 100, then copper is 74, iron 11.9, lead 7.9 and slag about 0.18. Owing to the diffusivity of copper being 3.6 times as much as lead, it is able to transmit its heat to surrounding objects without forming a crust that will confine the water between it and the sides of the mold; at the same time the steam will bubble up through the molten copper. This is not the case with lead which chills almost immediately, forming a crust that confines the water and then converts it into steam which, expanding quickly, throws the lead out of the mold.

It is possible that the lead crust cracks and the water coming in contact with the molten interior generates the explosion as in the case of metal in slag when that is poured in water; in any case, however, the diffusivity of lead is so slow that the outer portion is chilled before the inner portion has lost its latent heat, thus reversing the natural condition of cooling from the interior outward. In the case of copper falling some distance, the metal has transmitted its heat to the surrounding atmosphere and has reached the stage where it has little heat to transmit and consequently chills, but still has sufficient latent heat remaining to cause an explosion.

Diffusivity, as defined by Hastings and Beach, is the velocity of the temperature change of a metal and is the ratio between the conductivity of a metal and its specific heat. By calculation, the diffusivity of lead is 219 and that of copper 777, giving the 3.6 factor mentioned. The practical deductions are that metals with low-heat conductivity cannot be safely poured in wet molds, and that metals of high conductivity can only be poured in wet molds when the speed of pouring exceeds their diffusivity. Matte which has low conductivity cannot be poured into wet molds. The lack of literature on this subject was first called to my attention in 1903.



RETORT-CHARGING APPARATUS

Apparatus for Charging Zinc Retorts

The difficulty of charging zinc retorts by hand and the excessive wear of drum casings in most of the mechanical devices are claimed to have been eliminated in the apparatus, described by Emile Dor-Delattre in his British Pat. 13,822 of 1908. The apparatus is to be carried by a traveling crane and consists essentially of a rotary propeller or conveyer, rotating within a casing having a tangentially-disposed charging tube *F*. The propeller or conveyer consist of two disks, *P* and *Q*, connected by the blades *G*. The disk *P* is attached to the shaft of an electric motor, while the disk *Q* has a circular opening in the center, through which the ore from the hopper discharges. The feed is controlled by a valve operated by the hand-wheel *M*. The disks *P* and *Q* are not parallel, but incline toward their periphery, so as to facilitate the entrance of the material and its immediate gravitation to the shallow blades *G*. In order to eliminate the effect of centrifugal force and obviate as much as possible the friction of the ore on the blades and walls of the casing, the blades are made short, and being away from the central intake the material does not become involved in the rotation of the wheel immediately on entering the apparatus, and is, therefore, not projected centrifugally against the walls of the casing, but falls by gravity to that part of the periphery of the conveyer which is passing the charging tube, and is at once projected into the latter by the propelling effect of the blades.

Tin in Australia

Alluvial tin has been discovered recently near Pine creek in the Northern territory. According to a description in the *Mining Journal*, May 8, 1909, furnished by the chief warden, E. C. Playford, this discovery is in a large granite area in the Pine creek slate and sandstone belt. The tin ore is found about 13 miles southwest of Pine creek, in the channel of one of the main branches of Spray creek. The granite area of this particular place forms a basin, bounded on the northwest and south by sandstone-capped tablelands, and partly inclosed to the east by table-topped hills from 150 to 200 ft. high. The branch of Spray creek referred to has formed a rough, deep, gorge with precipitous cliffs on each side, over 100 ft. high. Alluvial tin is found from near the entrance of this gorge to the head of the main branch.

At present 15 men are working on this alluvial deposit and are obtaining about 25 lb. of tin per day, each. This tin ore is black, with a little brown, ruby, amber and wood tin. In the lower regions of the main branch it is exceptionally fine, but higher up and in some of the smaller creeks is much coarser. Mr. Playford considers that this field will yield a large amount of alluvial tin, but is not favorably impressed with the possibility of finding payable tin-bearing veins. All the rock consists of a gray granite and sandstone, with a little quartz that can be classed as destitute of any valuable minerals. A small amount of monazite has also been found with the tin.

The Mineral Production of New York in 1908

By D. H. Newland*

The year 1908, which will be remembered as an after-panic year, witnessed a marked reversal of conditions in the mineral industries of New York. Prosperity and steady expansion, that had so long prevailed in these industries, was succeeded by general depression and contraction, which continued with little or no relief throughout the 12 months. There were few mines or quarries that did not curtail operations, and many of them were closed down for at least a part of the year. The decline in productive activity was out of proportion to the rate of growth in the preceding years, so that the outputs of most materials were well below the totals recorded for 1907. Though the setback will doubtless prove only a temporary feature, it is certain that some time must elapse before the former activity is fully restored.

The statistics of mineral production in New York for the past year have been compiled by the State geologist's office in coöperation with the U. S. Geological Survey. The accompanying table (1), reported by the New York State Museum, gives the production of the more important minerals in New York for a period of years; table 2 gives the 1908 production of sundry minerals in the State. Though the 1908 figures for clay products, stone, sand and natural gas, which are totals from a large number of producers, are subject to further revision, they are believed to be substantially correct as they stand.

The total value of the output reported for 1908, based upon the materials in their crude or first marketable forms, was $29,517,942. Compared with the total of $37,140,606 recorded in 1907, this showed a decrease of $7,622,664, or about 20 per cent. The output in 1907 was the largest ever made in the State, though it did not greatly exceed that of 1906, which was valued at $37,132,832. The corresponding total for 1905 was $35,470,897 and for 1904, $28,812,595, or a little less than the total for last year.

Effect of the Financial Depression

Among the different departments of the mineral industry, iron mining was one that experienced the full measure of the depression, as it also had been among the first to respond to the prosperous conditions of the preceding years. The output amounted to 703,473 long tons, against 1,018,013 tons in 1907. The production was made by 10 mining companies, as compared with 13 reported active in 1907. The loss was shared by all the districts, though in larger portion, by the mines on the Clinton hematite belt, which had been under recent development, while the Adirondack magnetite mines made the most favorable showing. The value of the iron produced in 1908 was $2,098,247.

The production of clay materials aggregated in value $8,918,863, as compared with $12,688,868 in the preceding year. The decrease of about 30 per cent. was due both to a smaller output by the plants and to a reduction in market values. The combined output of brick, tile fireproofing and terra-cotta used for building purposes was valued at $6,071,850, against $8,909,392 in 1907. In 1906 these materials represented a value of $11,063,433. The number of building brick made last year was 1,066,533,000, of which 817,459,000, or about three-fourths represented common brick from the Hudson river region. Along with the decline in building materials there was a large decrease in the ceramic industry, the value of pottery manufactures amounting to $1,653,241, as compared with $2,240,895 in 1907. The number of plants that were engaged in clay manufacturing of all kinds was 240, or two less than in 1907.

The value of the quarry products for 1908 was $6,615,614, against $7,890,327 in the preceding year, a falling off of 16 per cent. The total was divided according to the various uses into: Building stone, $1,264,403; monumental stone, $139,077; curb and flagstone, $928,511; crushed stone, $2,659,016; other uses, $1,640,275. The output of slate, millstones and limestone used in making hydraulic cement is not included in the figures. Of the different kinds of stone, granite was the one to show a gain and this was accounted for by its increased use for paving blocks and crushed stone. The quarries of the State are able to supply almost every variety of rock for building and other purposes, though there is a large importation from other States.

The manufacturers of hydraulic cement contributed in 1908 a production valued at $2,254,759. In 1907 the value amounted to $2,971,820. Of the product last year 1,988,874 bbl., valued at $1,813,623, consisted of portland cement and 623,618 bbl., valued at $441,136, of natural rock cement. The latter industry has shown a steady decline for a number of years, due to general conditions in the trade. On the other hand the situation in the portland-cement industry may be expected to improve and there is every prospect that the State will soon have a much larger share in the domestic production than at present.

From the salt mines and wells there were obtained last year 9,005,311 bbl., valued at $2,136,736. The showing was better, relatively, than in many other branches of the mineral industry; as compared with the figures for 1907 (9,657,543 bbl., valued at $2,449,178), there was a falling off in production of less than 7

TABLE 1. MINERAL PRODUCTION OF NEW YORK.

Year.	Carbon Dioxide.		Cement, Portland.		Cement, Nat. Hyd.	
	Pounds.	Value.	Barrels.	Value.	Barrels.	Value.
1904	4,000,000	$280,000	1,377,302	$1,245,778	1,881,630	$1,207,883
1905	4,000,000	280,000	2,117,822	2,046,864	2,257,698	1,590,689
1906	5,000,000	350,000	2,423,374	2,766,488	1,691,565	1,184,211
1907	5,000,000	350,000	2,108,450	2,214,090	1,137,279	757,730
1908	5,000,000	350,000	1,988,874	1,813,622	623,618	441,136

Year.	Emery.		Feldspar and Quartz.		Garnet.		Graphite.	
	Short Tons.	Value.	Long Tons.	Value.	Short Tons.	Value.	Pounds.	Value.
1904	1,148	$17,220	8,703	$28,463	3,045	$104,325	3,132,927	$119,509
1905	1,475	12,452	17,000	48,500	2,700	94,500	3,897,616	142,948
1906	1,307	13,870	13,660	44,350	4,729	159,298	2,811,582	96,084
1907	1,223	13,057	8,723	36,230	5,709	174,800	2,950,000	106,951
1908	690	8,860	18,125	66,304	2,480	79,890	1,932,000	116,100

Year.	Gypsum.		Iron Ore.		Metallic Paint.		Natural Gas.	
	Short Tons.	Value.	Long Tons.	Value.	Short Tons.	Value.	1000 Cu. Ft.	Value.
1904	151,455	$424,975	619,103	$1,328,894	4,740	$55,768	2,399,987	$552,197
1905	191,860	551,193	827,049	2,576,123	6,059	70,090	2,639,130	607,000
1906	262,581	685,053	905,367	3,393,609	2,714	29,140	3,007,086	766,579
1907	323,323	1,038,355	1,018,013	3,750,493	5,269	59,521	3,052,145	800,014
1908	318,046	760,759	703,473	2,098,247	5,750	54,500	3,860,000	987,775

Year.	Petroleum.		Pyrite.		Salt.		Talc.	
	Barrels.	Value.	Long Tons.	Value.	Barrels.	Value.	Short Tons.	Value.
1904	1,036,179	$1,709,770	5,275	$20,820	8,724,768	$2,102,748	65,000	$455,000
1905	949,511	1,566,931	10,100	40,465	8,575,649	2,303,067	67,000	469,000
1906	1,043,088	1,721,095	11,798	35,550	9,013,993	2,131,650	64,200	541,600
1907	1,052,324	1,736,335	49,978	162,430	9,657,542	2,449,178	59,000	501,500
1908	1,160,128	2,071,533	23,675	104,799	9,005,311	2,136,736	70,739	697,390

*Assistant State geologist, Albany, N. Y.

per cent. For many years the output of the State increased very rapidly, and it now amounts to about one-third of the total for the entire country. Onondaga county, where salt making was first introduced more than a century ago, still held the leading place last year, though most of its product was not put into marketable form, but was consumed for the manufacture of soda products. Livingston and Wyoming counties led in the production of rock and brine salt, respectively, for the trade.

The mines and quarries of gypsum contributed an output of 318,046 short tons, or nearly the same as in 1907, when it amounted to 323,323 short tons. The value of the different gypsum materials, including plaster of paris, wall plaster and gypsum sold in crude condition was $760,759 in 1908, against $751,556 in the preceding year. The gypsum industry has grown remarkably in the last few years, the output of the State having increased nearly ten-fold in the decade from 1898. With the inexhaustible supplies afforded by the local deposits and the unrivaled facilities for reaching the principal eastern markets, there is every prospect that the production will soon reach even greater proportions.

The combined value of the petroleum and natural gas produced in the State last year was $3,059,308 against $2,536,349 in 1907. The quantity of petroleum taken from the wells amounted to 1,160,128 bbl., valued at $2,071,533, as compared with 1,052,324 bbl., valued at $1,736,335 in the preceding year. The natural gas production was valued at $987,775 against $800,014 in 1907; the volume of gas amounted to 3,860,000,000 cu.ft. against 3,052,145,000 in the preceding year. The exhaustion of both the petroleum and natural gas pools does not seem to be imminent, judging from the records of production for recent years.

A product of which the State has almost a natural monopoly is fibrous talc, which is found in St. Lawrence county in extensive deposits of superior quality. The material is consumed mostly in the paper trade and is shipped to all parts of the country as well as to foreign mills. The output of ground talc last year amounted to 70,739 short tons, valued at $697,390, and showed a good gain over the total for 1907, which was reported as 59,000 short tons with a value of $501,500.

The garnet mines in the Adirondacks were worked last year on a much reduced scale. The output of 2480 short tons, valued at $79,890, was less than half that for 1907, when 5709 short tons, with a value of $174,800, were reported. The decline may be ascribed to the smaller demand for abrasive materials during the year.

Crystalline graphite was mined in Warren and Saratoga counties. The output amounted to 1,932,000 lb., valued at $116,100, against 2,950,000 lb., valued at $106,951, in 1907.

The mineral springs of the State reported sales last year of 8,007,092 gal., valued at $877,648, or about the same as in the preceding year. Saratoga county with the famous Saratoga and Ballston springs, contributed about $175,000 to the total value.

Among the other mineral products of New York last year were apatite, carbon dioxide, clay, diatomaceous earth, emery, feldspar, marl, millstones, metallic paint, slate pigment, pyrite, quartz, slate, sand and sand-lime brick, the aggregate value of which amounted to $1,902,628, as compared with $2,317,384 in 1907.

TABLE II. SUNDRY MINERAL PRODUCTION OF NEW YORK IN 1908.

Product.	Unit.	Quantity.	Value.
Building brick	Thousands	1,065,533	$5,200,951
Pottery	.....	.....	1,653,241
Other clay products	.....	.....	2,064,671
Crude clay	Short tons	4,697	11,605
Millstones	.....	.....	18,341
Slate pigment	Short tons	922	7,376
Mineral waters	Gallons	8,007,092	877,648
Sand and gravel	.....	.....	1,130,291
Sand-lime brick	Thousands	8,239	55,688
Slate	.....	.....	111,217
Granite	.....	.....	367,564
Limestone	.....	.....	3,119,835
Marble	.....	.....	692,857
Sandstone	.....	.....	1,711,585
Trap	.....	.....	723,773
Other materials (*a*)	.....	.....	333,648
Total value	.....	.....	$29,517,942

a Includes apatite, carbon dioxide, diatomaceous earth and marl.

Anglo-Siberian Company, Limited

At a recent meeting, in London, of the shareholders of the Anglo-Siberian Company, Limited, which owns extensive timber, iron and copper interests in eastern Russia, Thomas Blair Reynolds, chairman of the company, in reviewing its work said in part:

"Early in 1907 the company secured an interest in an option for purchasing the Kyshtim Mining Works, owning large estates in the region of the Ural mountains. During the option period the proving of recently discovered copper lodes was undertaken, but it was found that the period of the option was not long enough to determine the value of the deposits of copper and an extension of the option was obtained and further capital provided.

"The Perm Corporation was thereupon formed for the purpose of taking over the rights and obligations of the option contract. Subsequently it was decided that the results of the investigations justified the exercise of the option, and accordingly the Perm Corporation formed in November, 1908, a new company to be called the Kyshtim Corporation, with provision for the necessary capital to carry on the timber, iron and copper industries of the estates.

"The Anglo-Siberian Company's assets consist of shares in the Perm Corporation and shares and debentures in the Kyshtim Corporation. The company holds about 43 per cent. of the issued capital of the Perm Corporation, which owns 521,574 Kyshtim Corporation shares. Therefore, this company has an interest equivalent to 224,000 shares of the latter corporation. There is a heavy debt on the estate, but the sale of timber with due regard to the proper system of forestry which is now enforced, is a permanent source of revenue for the payment of interest and amortization, and the charges on the estate are entirely provided for by the agricultural land and forests, leaving the working of the iron and copper deposits as free as if they were upon an unencumbered estate.

"The iron industry at Kyshtim has an output of various classes of fabricated products amounting to about 30,000 tons per year. Improvements in manufacture have reduced the costs and combined with alterations in methods will obviate the necessity of holding such large stocks of raw material, and consequent lock-up of capital, as has heretofore been necessary. The grading for the light railway connecting the copper mines at Soimonovsk with the main line at the town of Kyshtim is under way and the foundations are being prepared for the new buildings required for our copper-smelting plants. At one time it was intended to rush this work so as to start it at the beginning of next year, but it is now thought more prudent for technical and other reasons to defer the actual erection of the plant until the railway is completed, so that the material may be transported by it. The smelter, however, will start well within the period originally estimated by the engineers.

"The electrolytic plant started work in March, 1909, and is now converting into cathode copper and wire bars our own production of copper. A bore hole which has been driven on the Koniukhoff copper property has cut the lode 650 ft. on the dip below the line on which our engineer based his estimate of tonnage. The lode was found to be 9 ft. thick and will add materially to the reserve of the company, which was previously estimated at 500,000 tons. Another matter of much interest to the company is the proposed extension of the government railway from north to south through the whole of our western estate and touching the principal sheet-iron works at Niazepetrovsk, to which it will be of the utmost benefit."

Only 50 tons of tin ore, valued at $12,500 were produced in the United States in 1908. In 1907 the output was 63 tons valued at $15,209. The above data is from statistics of THE MINERAL INDUSTRY.

Notes on Various Applications of the Elmore Vacuum Process

By A. Stanley Elmore.*

As the successful development and introduction of a novel process for the treatment of ores is a matter of general interest to metallurgists it is thought that the following notes may be of some value to those contemplating the erection of ore concentration plants. No detailed description of the process is called for here as full particulars appeared in the Journal of May 11, 1907.

The scheme of treatment for a given ore is as follows: The ore is crushed wet to such a mesh as will reasonably liberate the particles to be recovered from the associated gangue. The pulp is then agitated with small quantities of oil and acid. The oil adheres to the metallic particles, leaving the gangue free from oil.

The pulp so prepared is then subjected to a vacuum (usually corresponding to about 20 to 27 in. of mercury), when the mineral will be found to have floated to the surface, leaving the gangue at the bottom of the vessel in which the operation was conducted; thus a very sharp separation is secured yielding a clean concentrate.

Like every other metallurgical invention the Elmore vacuum process has its limitations; however, its field of application is much wider than has been supposed by some engineers. Furthermore, it was supposed in the early days of its introduction that the apparatus for carrying the process into effect was necessarily complicated, expensive and delicate in working. Several years' experience in mills, treating large tonnages of ore under usual working conditions, with ordinary labor, has totally disproved some of these erroneous impressions.

Continuous workings, in some cases for periods of two years, have shown that the plant is practical, simple and substantial. The Elmore invention has found a wide application. Although much time has been occupied in establishing confidence in the process, it would doubtless have been much longer had not the company controlling the patents, placed a well equipped testing works at the disposal of likely users. These works are equipped with automatic samplers, as well as floors for hand sampling, and in all cases of testing, either on a small or large scale, the supervision of independent engineers has always been invited. In this way accurate data under working conditions are secured for the satisfaction of intending licensees.

It is interesting to note that in every one of the working plants quoted below, the orders were secured as a result of trials carried out at the testing works.

*Chairman, the Ore Concentration Company, Ltd., 4 Broadstreet Place, London, Eng.

Elmore Process Installations

Dolcoath Mine, Cornwall.—In certain parts of this mine the ordinary tin ore is found impregnated with varying proportions of sulphides, principally of copper. This ore is crushed in the usual Cornish stamp battery and passed direct to one unit of an Elmore plant. By this operation most of the sulphides are floated out and recovered as a high-grade copper concentrate, which contains, approximately 2 to 3 lb. of tin per ton. Practically all of the tin oxide is left in the tailings from the Elmore plant. These tailings are subsequently treated by Frue vanners in the ordinary way for the recovery of the tin oxide. The oil and acid used in the Elmore apparatus in no way injuriously effects the subsequent recovery of the tin. This plant was supplied to the Dolcoath company in March, 1907, and continues to yield satisfactory results, giving an extraction of over 90 per cent. of the copper contents of the ore.

Ramsley Mine, Devonshire.—The ore treated consists of a mixture of chalcopyrite and bornite with some chalcocite in a slaty micaceous gangue, containing about 2½ per cent. copper. It is crushed in stonebreakers, high-speed rolls, and Huntington mill in the usual way. The pulp is sent direct to one unit of the Elmore plant. The concentrates produced assay about 12 per cent. copper. The plant has been in operation about seven months and is to be enlarged shortly.

Dolgelley Mine, North Wales—The ore consists of chalcopyrite with varying proportions of pyrite in a schistose gangue. The grade of the ore operated upon is usually about 1.2 per cent. copper, 0.08 oz. gold and 0.8 oz. of silver per ton. The ore is crushed by a reciprocating stonebreaker, followed by a California 20-stamp battery (1050 lb.) reducing it to 6-mesh. The pulp from the battery is sized on a 16-mesh screen and the oversize recrushed in a grinding pan. The pulp is then sent direct to three units of the Elmore plant and yields a concentrate of about 12 per cent. copper, 0.7 oz. gold and 7 oz. of silver per ton, the tailings assaying about 0.25 per cent. copper with small amounts of gold and silver.

Prior to the installation of the vacuum plant much money had been spent at this mine on various forms of water concentration machines. Owing to the extreme softness of the copper sulphides and the unusually tough character of the rock the loss in fines was always prohibitive, and such attempts were finally abandoned in favor of the vaccum plant which has been in continuous operation for two years.

The Zinc Corporation, Broken Hill.—The material is a zinciferous tailings from the lead dressing mills treating the well known Broken Hill ore. The gangue consists largely of garnet and rhodonite and has practically the same specific gravity as the zinc blende with which it is associated. Separation by ordinary water concentration is not possible on this material. The tailings on the dump are already fine enough for direct treatment in the Elmore plant; that portion which is too coarse is crushed in 12 grinding pans, and sized on improved revolving screens; the oversize is recrushed on six additional grinding pans. The average assay of the material operated on in this plant so far is zinc, 20 per cent.; lead, 5.75 per cent. and silver 8 oz. per ton. This yields concentrates assaying zinc, 43 per cent., lead 11 per cent. and silver, 17 oz. per ton. It has been found that if these concentrates be dried and subjected to a sufficiently high temperature to drive off the small quantity of oil which it contains, the de-oiled concentrate may then be mixed with water and passed over Wilfley tables yielding a zinc product assaying zinc, 46.5 per cent. Lead, 7.35 per cent.; and silver 16 oz. per ton; and, a lead concentrate assaying lead, 58 per cent.; zinc, 15 per cent. and silver 39 oz. per ton. The value of the final residues from this Elmore plant depends to a great extent upon the more or less oxidized condition of the mineral in the material operated upon (much of the material on these dumps has been exposed to atmospheric oxidation for many years). The following may be taken as fairly representative: Zinc, 3.5 per cent.; lead, 2.2 per cent. and silver 2.2 oz. per ton.

Careful determination has shown that a large part of the metal contents is present in the form of oxidized compounds. The actual recovery secured by the Elmore plant at the Zinc Corporation may be taken as follows: Zinc 90 per cent.; lead, 73 per cent. and silver, 85 per cent.

The 16-unit plant was installed only after most exhaustive trials had been carried out with one unit. The mill handles about 18,000 tons per month and produces about 7000 tons of concentrates. This mill, which has been in continuous operation for 15 months, gives a higher capacity, better grade of concentrate and greater percentage of extraction than was indicated by the trials with the one unit plant.

Edmundian Copper Mine, Africa.—The ore consists of chalcopyrite very finely disseminated through a feldspathic gangue. It is crushed by stonebreakers and Holman pneumatic stamps and passes directly to a two-unit Elmore plant. The ore assays about 2.5 per cent. copper and yields a concentrate assaying about 22.5 per cent., with a recovery of 85 per cent. of the copper.

Garpensberg Mine, Sweden.—The ore consists of a quartz gangue with magnetite, chalcopyrite and pyrite. It is low grade, assaying about 1 per cent. copper.

The crushing plant consists of a stonebreaker followed by rolls, the product going to jigs and tables in the ordinary way. The table tailings, together with the jig tailings after recrushing in wet ball mill, are treated in the vacuum machines. One unite was tried first; later two more were installed, and one more is about to be erected.

Traag Mine, Norway.—The ore carries both zinc and lead associated with a heavy gangue. After crushing in stonebreakers and Huntington mills the pulp is treated on Wilfley tables for the production of a lead concentrate. The tailings from the Wilfley table go to the single unit Elmore plant which yields a concentrate assaying about 58 per cent. zinc. The zinc sulphide in the ore is a friable, resin blende and, in consequence of excessive sliming coupled with heavy gangue, was found to be practically impossible of collection by ordinary water concentration appliances.

Hadeland Mine, Norway.—The ore consists of zinc blende associated with a large proportion of magnetite and some spathic iron. Trials with various water concentration appliances had all proved quite unsatisfactory. The ore is crushed in Krupp ball mills and sent direct to the Elmore plant. It yields a high grade concentrate with a very satisfactory extraction. The company, after having operated the one-unit plant for about six months, has ordered three additional units.

Telemarken Mine, Norway.—The ore consists of chalcopyrite and bornite in a gangue composed of hornblende, micaceous schists and hard quartz. The crude ore from the mine is hand sorted. The ore thus enriched contains about 4.5 per cent. copper. It is crushed in a No. 5. Gates crusher, followed by Ferraris wet ball mills. The pulp is sent direct to a three-unit Elmore plant, from which concentrates assaying about 26 per cent. copper are obtained, the final tailings containing only 0.20 per cent., thus giving a recovery of about 95 per cent. of the total copper content.

Sulitelma Mine, Norway.—The ore carries copper in the form of chalcopyrite, associated with a large proportion of pyrite, the gangue being micaceous schist. As the ore comes from the mine it is crushed in large stonebreakers and carefully hand sorted. The clean lump pyrite is sold to suphuric acid works where it is roasted for its sulphur. The cinder is subsequently treated for its copper contents. The low-grade ore left after hand sorting is crushed with rolls and passed to jigs, tables, and vanners.

This water concentration plant is of first class design, operated with good labor and under excellent technical supervision and control. Nevertheless, the loss of copper in the tailings is heavy owing to the particularly friable nature of the copper pyrites. The residues from this water concentration plant vary in grade from 1 to 1¼ per cent. copper, associated with pyrite and some magnetite. The water concentration mill handles about 800 to 900 tons a day and produces about 500 to 600 tons a day of tailings. These tailings are an unusually dilute pulp, the proportion of water to solids being about 100 to 1. At present about 400 tons of solids per day with the above proportion of water, are sent to the twelve-unit Elmore plant for the recovery of the copper. Arrangements are being made which will enable all of the tailings from the water concentration plant to be sent to the Elmore plant.

The small part of the tailings, too coarse for treatment direct in the Elmore process, are recrushed by Heberle ball mills. The pulp, which as before stated is associated with an immense amount of water, is run into large settling tanks to get rid of the excess of water. Concentrates varying from 6 per cent. up to 11 per cent. of copper (the grade depending upon the proportion of iron pyrites) are produced. The final tailings assay 0.2 per cent. copper. The great bulk of the material handled by the vacuum machines consists entirely of slimes. An average of about 150 tons of concentrates per week are produced from waste material which had previously been discharged direct to the tailings dump.

Saxberget Mine, Sweden.—The ore is a mixed zinc-lead-silver material which, after crushing in stone-breakers and wet Gröndall ball mills, is treated on tables for the recovery of the lead. The lead recovery by this means, however, is not good, and consequently the tailings from the tables, in addition to the zinc, contain notable proportions of lead and silver. Various attempts have been made previously to treat these tailings but without success. The Elmore plant is now producing mixed lead-zinc-silver concentrates which are subsequently smelted in an electric furnace.

Each unit of the plants represented above may be assumed to be treating 40 tons of ore per 24 hours equal to more than half a million tons per annum. It is interesting to note that in every instance these plants are working with the ordinary class of labor available at the several mines. They have been in operation for periods of time up to two years, and in each case are operating independent of any supervision by the company controlling the patents. It may therefore be reasonably assumed that the Elmore vacuum process has now taken its place definitely among recognized methods of ore treatment.

Attention is particularly directed to the variety of ores which are being treated regularly on a large scale, and to the still much greater variety of ores which have been tested both on a large and small scale at the testing works. Special emphasis is laid on the great variety of crushing machinery which is employed with different ores in the various mills in connection with the Elmore process, and to the fact that plants are in regular operation in such extremes of climate as are found between Broken Hill, New South Wales, where the summer temperature reached 110 deg. F. and the Sulitelma mine which is 180 miles north of the Arctic circle where a winter temperature as low as —37 deg. F. is usually recorded.

Antimony in China

According to a recent report by the British consul at Changsha, the increase in the export of crude antimony and the decrease in the export of ore in 1908 were both noteworthy. The local notables who control the antimony works are in touch with London, and are kept fully informed as to the prices ruling in the London market. It seems probable that the export of ore will continue to decrease, owing to the erection of new machinery and the better handling locally of the ore, and that the export not only of crude, but of refined antimony will steadily increase.

The increase in the export of crude is, no doubt, due to the presence of a foreign buyer in Changsha. The old difficulty still exists of inducing the sellers to realize the binding nature of a contract, but constant personal contact between the native seller and the foreign buyer ought, with patience, to remove this serious obstacle to a satisfactory working basis, and it seems likely that in the future contracts will be more punctually fulfilled.

The price of crude, Changsha sales, varied from £10 13s. 4d. to £11 6s. 8d., and of ore from £4 13s. 4d. to £6 13s. 4d. It is hoped with the new machinery to produce refined antimony containing at least 99.6 per cent. and possibly 99.8 per cent. antimony. The relative value of refined to crude will be about £26 13s. 4d. to £10 13s. 4d. per ton.

During the past years the ore in Changsha has been so crudely smelted that waste ashes have been found to contain 30 per cent. antimony; many thousands of tons of such ashes have, from time to time, been thrown away, and money has been made by at least one enterprising foreigner who bought up all the ashes he could. This form of speculation is, however, now at an end.

Another point should be noted. In the past low-grade ores have been rejected owing to the imperfect furnaces in use, but with the improved machinery all low-grade mines should also become valuable and the export of antimony be greatly increased. A foreigner, well qualified to give an opinion, states that the richer ore found in Human is only equaled by one mine in France.

Geology of the Yellow Aster Mine, California

Remarkable Ore Deposits in Granite at Randsburg, Kern County, That Have Produced about $6,000,000 in Gold. Discovered in 1895

BY WILLIAM H. STORMS*

The consolidation of mining claims owned by the Yellow Aster Mining Company, of Los Angeles, Cal., constitutes one of the most important gold-mining properties of the West. The mines are situated in the Mojave desert, Kern county, California, about one-half mile south of Randsburg.

The discovery of gold in the district was made in 1895 by C. A. Burcham, Fred M. Mooers and John Singleton, who came into the region from the dry placer camp, at Goler, where they had met with indifferent success. The first discovery of gold was made in the dry sand of a gulch which cut the outcrop of the gold-bearing veins of the Yellow Aster hill. The dirt was concentrated in a dry-blowing machine. Soon after this the veins were discovered and development proceeded as rapidly as the isolated situation of the property would permit.

The output of high-grade ore from the various mines about Randsburg early attracted much attention. For the most part, the veins proved to be rather short and narrow fissures in micaceous and hornblendic schists, and the first few years of active mining rapidly depleted the smaller veins on the ridge, north of town, known as Butte hill. The group of claims to the south, on Yellow Aster hill, developed year by year until the consolidated claims, known as the Yellow Aster mine, became an important and productive gold mine.

A Region of Horizontal Schists

For several miles about the village of Randsburg, the rocks consist chiefly of a series of granitoid schists, comprising both micaceous and hornblendic varieties. In some parts of the region typical amphibolite schist occurs. The hornblende schists are often fissile at and near the surface, having distinct schistose structure. These typical schists are found interbedded with layers of granite rock 4 to 5 ft. in thickness, possessing little or no trace of schistosity. These bedded schists extend in a northeast-southwest direction, a southwestern extension of the Slate range, although wholly detached from the latter range of mountains.

Origin of the Flat Schists

That horizontal schists extending over any considerable area are unusual, will be readily admitted. Several theories to account for those about Randsburg have been advanced by prominent geologists. Among these theories is the possibility that the rocks comprising the schists were, at one time, buried so deeply that the tremendous pressure of the superincumbent mass induced a condition of schistosity.

Another theory, and a more probable one is that schistose conditions have been produced by the proximity of a huge batholith (probably granite) that may underlie the region. Still another theory conceives that the schistose and semi-schistose structure is due to the rocks having originally been deposited as a series of flows. This latter supposition seems improbable, as none of the rocks are of volcanic type, but of granitic character.

The only remaining tenable theory is that the schistose structure may, to some extent, represent original sedimentation; and, that these, now crystalline schists, were originally horizontal sedimentary beds, which have been brought to an extreme state of alteration by pressure, still preserving traces of their original horizontality.

Personally I favor the theory of the batholith, which, in my opinion, lies at no very great depth beneath the present surface. To some extent the topography of these hills is influenced by the character of the rocks, the slopes of some of the hills conforming to the dip of the schists.

FIG. 1. YELLOW ASTER HILL FROM THE NORTH; 100-STAMP MILL AT THE RIGHT; 30-STAMP MILL AT THE LEFT

*Mining engineer, Los Angeles, Cal.

The Surrounding Region

Northeast of Randsburg, 3 or 4 miles, is an eminence known as Red mountain, which consists entirely of volcanic rocks—rhyolite, tufa and tuffaceous-breccia, but so far as known, no ore deposits of any description exist in this volcanic area. Less than a mile east of Randsburg, are large intrusions of granite, in which are included several irregular masses of limestone. These were probably torn from an older formation lying beneath, but which is unknown elsewhere in the vicinity of Randsburg. There are limited occurrences of quartzite and dense jasperoid rocks nearer town, particularly on the north slope of the ridge known as Butte hill, which, with the limestones, indicate sedimentary origin. Four miles east of Randsburg, dikes of pegmatite cut the schists. These dikes have, among other constituents, ores of tungsten—notably scheelite, which has been profitably mined in the Atolia mine.

West of the Randsburg district is a desert valley about six miles in width, on the farther side of which is Goler, the noted dry-placer camp. Several deep wells sunk here, on what is presumed to be an ancient gravel channel, furnish the principal water supply for the Yellow Aster mine; a further supply being obtained from other deep wells sunk six miles northeast of Randsburg. Goler lies at the mouth of a cañon cutting a north and south range of rugged hills, which consist mainly of schist. These schists are of a different type from those at Randsburg and vicinity, being evidently the result of the alteration of various greenstones. Igneous intrusions of huge dimensions are not uncommon in these hills.

South of Randsburg schistose rocks extend for many miles, and in them are known to be numerous gold-bearing veins, some of which have been profitably exploited.

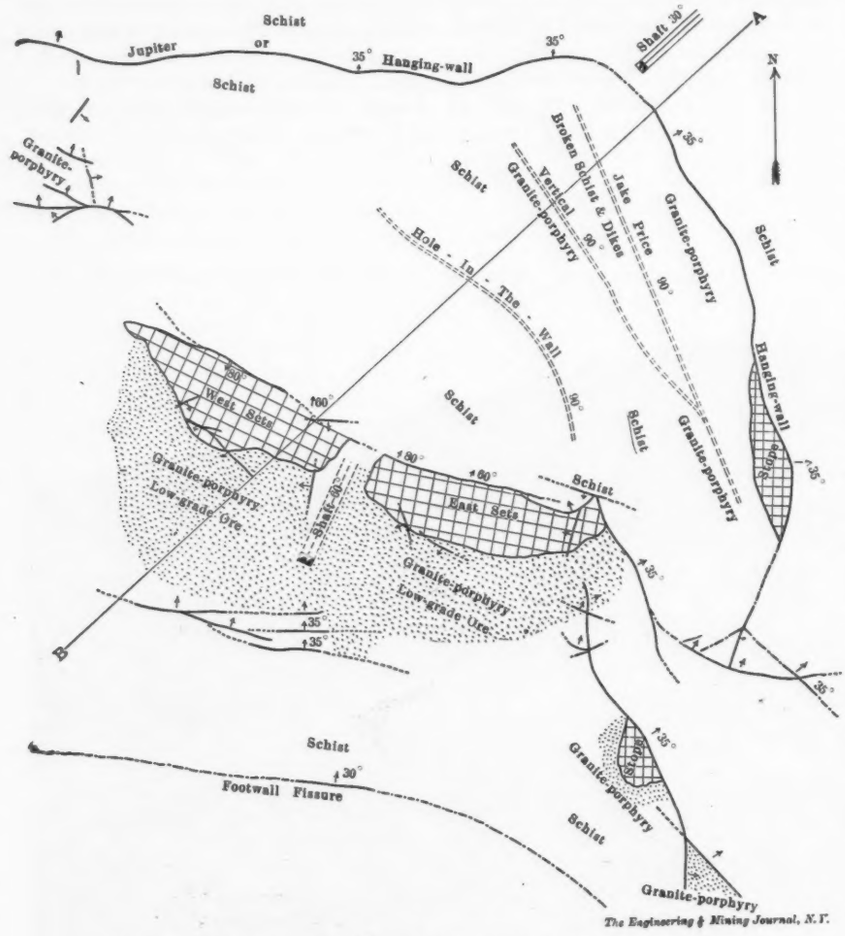


FIG. 2. SKETCH-MAP SHOWING FISSURE SYSTEM ON THE RAND LEVEL OF THE YELLOW ASTER MINE

Yellow Aster Hill

The hill in which the Yellow Aster mine is situated is among the highest of the range. This hill is the result of a domelike uplift of the flat schists previously described. The schistose rocks, originally nearly horizontal, have been intruded by numerous dikes, large and small, and these intrusions have caused the older rocks to be lifted into a dome, the effect extending for thousands of feet in all directions from the center of disturbance. Not only have the intrusive masses lifted the schists from their flat position into a dome, but they have thrown them into a series of sharp folds, some of which appear near the northern base of the hill, east of Main street, and others in the cañon west and southwest of Randsburg. These folds afford additional relief from the tremendous compressive stress resulting from the repeated intrusion by a series of remarkable fissures occurring in Yellow Aster hill, along all of which a greater or less amount of movement has taken place.

The accompanying sketch map, Fig. 2, of the Rand level, which is at present the main working level of the mine, shows the distribution of the most of these fissures, and the relations to one another, and also, to some extent, to the various orebodies.

The footwall fissure—seemingly the only one that is absolutely continuous, so far as known—at the west end of the property in Olympus claim, has a strike a few degrees north of west, dipping about 30 deg. to the north. It runs easterly, gradually turning in a broad, sweeping curve to the south, until in a distance of 3000 ft. it strikes directly south, dipping 35 deg. east. This fissure is indicated on the map, and is found at several points in the mine workings and in surface cuts. It is generally accompanied by one or two feet of tough, putty-like gouge. The sweeping curve of its strike from nearly east-west to due south is somewhat unusual.

There are other fissures in the southern area of the property, the more important of which are indicated on the map, but these fissures seem to be a series of fractures following a common direction and overlapping each other, rather than continuous fractures.

What is commonly called the hanging-wall fissure is not such in reality, for orebodies occur both above and below. This fissure, known as the Jupiter, is also indicated on the map. In the west end of the mine the strike is nearly east-west, almost parallel with the footwall fissure, dipping north 20 to 25 deg., but becoming somewhat steeper toward the east, and with depth. Its dip is 35 deg. on the Rand level. This fissure and the footwall fissure are not over 30 ft. apart at the surface, in the west end of the mine. They separate rapidly eastward.

Proceeding along the Jupiter fissure, there may be observed numerous subsidiary fissures, which are part of the system of fractures due to the stress that produced the main fissures. Going eastward the Jupiter fissure also swings around to the southward, finally taking a more abrupt bend than the footwall fissure, eventually having a strike somewhat west of south, and uniting with some of the more important fissures in the interior portion of the area. The dip of this fissure is almost uniformly 35 deg. on the Rand level, but is somewhat less both above and below. At 400 to 500 ft., on the incline, below the Rand level, the dip

is 20 deg. In this respect it is similar to some important fissures elsewhere, notably the footwall fissure of the Comstock lode.[1]

Intrusive Rocks

The several dikes which cut Yellow Aster hill vary somewhat in strike, but all approach an east-west direction. About midway between the mine and the town a dike of greenstone is seen intersected by one of quartz-porphyry, at an angle of about 20 deg. No ore-deposits are known to accompany either of these dikes. In and about the mine itself the dikes dip from vertical to 60 deg., except where locally disturbed by movement subsequent to their intrusion.

These dikes comprise a variety of rocks, nearly all of which are acidic. They probably represent a differentiation of the granitic batholith, presumed to underlie the region. One of the most prominent dikes of the vicinity extends from the east side of the dome easterly a distance of two miles. It varies from 4 to 40 ft. in width and is nearly vertical. At the east end it spreads into a great mass of quartz-felsite 100 ft. or more in diameter. Near the Yellow Aster hill this dike is a typical quartz porphyry. At one place only in the mine workings was a dike found which appeared to be identical with this particular intrusion, but as it is not known to be in any manner associated with ore deposition, little exploration has taken place in its vicinity.

Among the other intrusions are several large dikes of felsite which are exposed both on the surface and in the mine workings. Some of these felsite intrusions are more than 100 ft. wide and several hundred feet in length. Where crushed and altered the felsite is usually gold-bearing, but always, as far as known, low grade.

Syenite occurs on a hill north of the summit of the dome, but it is not known to have any direct relation to the ore deposits below. Near this large outcrop of syenite is found a dark-greenish, much altered boss, which was probably originally diabase.

There are other large granitic dikes occurring at various places within the limits of the domal uplift. These rocks also, along crushed zones, are gold-bearing, being as a class somewhat better than the felsites, but not sufficiently rich to form ore of commercial value.

The Granite Porphyry

The main ore-bearing rock is granite porphyry. Ore occurs in it principally in three forms: As distinct vein-like masses usually adjacent to a fracture or fissure; as impregnations of the rock mass itself, and, more rarely, in cracks or seams traversing the granite. The first type has resulted from a more or less complete silicification of the granite, forming a dense quartz rock resembling dirty, yellowish-gray hornstone. The second is merely the result of impregnation of masses of crushed granite porphyry by gold-bearing solutions. This rock presents the appearance of a partly decomposed, medium-textured granite, slightly iron-stained, with occasional evidence of the deposition of secondary quartz. The third type is merely a series of irregular cracks, following a common direction through the granite-porphyry, and in these cracks or seams coarse gold is found.

The granite-porphyry occurs, like most of the other intrusions here, in great dikes having a strike approximately north 85 deg. west, dipping north. Several of these granite-porphyry dikes may be seen on the surface, cutting the nearly flat schists. They can be readily traced to the Jupiter fissure; but to indentify any particular dike below that plane of movement is most difficult, if not impossible, owing to the lack of definite knowledge of the amount of displacement that has occurred, as well as to the complex geological conditions in the region inclosed within the triangular section between the footwall and hanging-walls. Large masses of schist are found torn from their original beds, which are twisted and shattered between great irregular dikes of igneous rock. Not only this, but large sections of older dike rocks have also been broken from the earlier intrusions, and these are now found mingled with the schist in a chaotic mass between the later dikes. Moreover, the line of demarkation between schist and igneous rock is not always clearly defined, even where both rocks are exposed to daylight inspection in the great open cuts. They merge, one into the other, by a gradual transition.

All of the great orebodies of the mine have resulted from the infiltration of gold-bearing solutions into masses of crushed granite-porphyry. This is also true of many of the smaller, and sometimes isolated orebodies, but all of the granite-porphyry is not gold-bearing. Nor is it always, or even often, possible to distinguish, by its physical appearance, the pay rock from that which is poor. One of the chief duties of the shift bosses is to take samples of new faces of rock as fast as they are exposed. The ore occurs in zones of greatly varying width, from 2 or 3 ft. up to masses more than 200 ft. thick, and 40 to over 600 ft. long.

Striations along the Jupiter fissure indicate that the movement has not been uniform; they show that some blocks have moved horizontally, whereas others have moved in various directions, and in some instances the same rock has been shifted first one way and then another.

The largest stope in the mine has been opened on the Rand level. It is more than 600 ft. long, over 100 ft. wide in places, and nearly 100 ft. high. These dimensions do not indicate the total extent of this great mass of ore; but at the time it was mined they practically outlined the pay

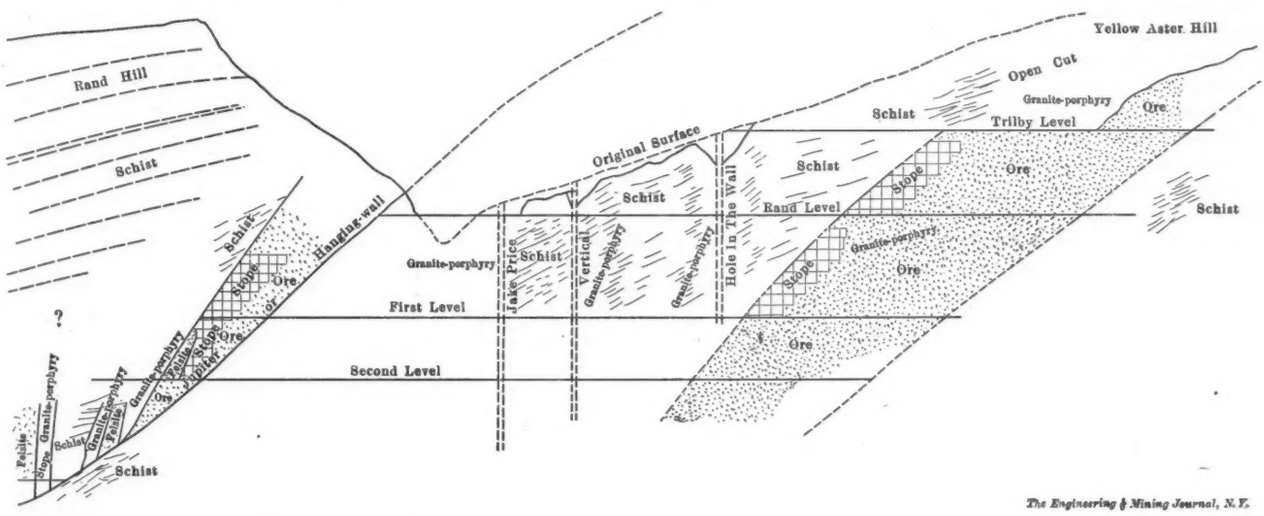


FIG. 3. SECTION THROUGH YELLOW ASTER MINE

[1]George F. Becker, *Geology of the Comstock Lode*, Monograph No. III, U. S. Geol. Surv.

ore. Great stopes have been opened on the extension of this orebody, both above and below the Rand level.

About 100 ft. west from the west end of the stope just referred to, begins another large orebody, but belonging to an entirely different series of oreshoots. Huge stopes have been opened on the Rand level, also above and below it. In all of these stopes the limitation of stoping has generally been determined by commercial considerations, excepting where the ore limit has been sharply defined by a fissure or abrupt change in the character of the rock, clearly discernible by the eye. The east stope on the Rand level, for instance, is sharply defined on the hanging side by a wall, although this fissure is one showing little or no movement. Over most of the area covered by the exposure of this wall there is little or no gouge, while on the footwall side the gold contents stops with no apparent change in the appearance of the rock. Throughout the mine there still remain large blocks of ore in the immediate vicinity of the principal stopes which will admit of little or no profit if mined by stoping and square-setting, timber costing over $40 per M as delivered, and over $50 per M set up in the mine. However, there is little doubt that much of this ore could be profitably mined if the open-cut system were applied to it. Development is resulting in the discovery of new orebodies in various parts of the mine, the diamond drill having been found particularly useful in searching for new masses of ore.

Distribution of the Ore

To the casual observer the distribution of ore in the Yellow Aster mine appears to be extremely erratic and haphazard. Yet when the general map of the mine workings is studied it is found that nearly all of the most important orebodies belong to one of several systems or groups, each following an independent trend. Then there are orebodies apparently isolated, but which may later be found to belong to separate systems, the relations of which will be better understood by more extensive development, although there are already over 16 miles of underground workings in the mine.

Of the two important oreshoots mentioned, the most extensively mined is that lying to the east of a line striking about north 25 deg. east and approximately through the two shafts indicated on the sketch map, Fig. 2. This oreshoot, or more properly, series or succession of oreshoots, outcrops at the surface on the south slope of Yellow Aster hill near the west end of the property, where it forms a large body of low-grade ore. In its downward dip and trend it lies east of the line mentioned, its trend being about north 60 deg. east. Much of the ore mined from this succession of orebodies was very profitable.

The other large orebody appears, or did appear, at the surface near that just described, but the upper portion has since been removed in the open cut or "glory hole." This orebody has a trend about north 15 deg. east, so that with depth these two great ore shoots became widely separated. In many respects these two orebodies are similar, particularly as to their size, form and manner of occurrence.

At least three other separate series of orebodies have been developed in the vicinity of the Jupiter wall. These are known as the Midway, the Buffalo and the Homestake. Most of the ore in the Midway series lies above the Jupiter wall, though some of it occurs underneath. At the Buffalo the greater part of the ore thus far developed lies underneath the fissure. In the Homestake-Hunt series is the Christmas stope above the Jupiter wall, but near the surface, on the Rand level, a rich shoot was found under and in close proximity to the wall. This shoot is in direct line with the Homestake and Christmas and may very properly be considered as belonging to the same series. It should be understood that none of the orebodies mentioned as connected with the Jupiter wall have any relation to, or connection with, the large masses of ore in the central portion of the mine.

In the southeast part of the mine and entirely separate from the orebodies already mentioned, are several other shoots, some of which have been very profitable. In this part of the mine, and also toward the west end are extensive bodies of low-grade ore which undoubtedly will be mined at a profit at some time in the future.

An interesting fact in connection with this mine is that if a cross-section were taken every 100 ft., no two of the sections would be alike, even those at adjoining stations. Most remarkable changes take place often within a few feet.

In the northeast part of the mine, and about 300 ft. below the surface is a stope known as the Hobo. On the 200 level the ore is about 4 ft. in width. The hanging side is defined by a good wall; the footwall is irregular. The hanging-wall is nearly vertical. The footwall slopes back with varying angle, until, 60 ft. above the level, the stope is about 20 ft. wide. Just above this the schist swings over the granite-porphyry from the hanging-wall, and the ore following it, rapidly thins out and becomes a mere seam a few feet above the next level.

Vertical Zones of Impregnation

In addition to the large ore-deposits already referred to, there also occurs, in the granite-porphyry, a series of nearly vertical zones of gold-bearing rock which have no walls. These are indicated on the map, Fig. 2, and section, Fig. 3, by the name—the Price, Vertical and Hole-in-the-Wall. These peculiar occurrences are in no sense veins or orebodies of definite form, being merely a series of reticulated cracks or seams occurring along a common direction, such as may be observed in granite. A slight brownish stain of iron oxide is about the only indication of mineralization noticeable in this rock, and much of it shows little sign of oxidation. Occasionally a little secondary quartz and sometimes pyrite is present. The granite in these zones presents no evidence of movement or shearing, but coarse gold occurs in these zones of fracture and impregnation, and they have proved very profitable, the Price and Vertical being particularly high grade. These veins, as they are called, have been stoped in the ordinary manner, from 4 to 12 ft. wide, and square sets placed in the wider portions.

Ore in the Schist

Ore rarely occurs in the schist. In almost every instance where the gold-bearing granite-porphyry is interrupted or cut off by schist the gold disappears. A remarkable exception occurred near the summit of the dome where a small fissure cut the schist. This vein carried much limonite and was rich in gold. The rock was soft and decomposed at the surface, and was run through a dry-blower with most satisfactory results. This place is known by the peculiar name "Instinct," the discoverer claiming that it was by instinct he found the orebody.

A Problem in Mining

The orebodies do not always reach the surface, some of the larger ones being overlaid by the horizontal schist from 20 to 80 ft. in thickness.

Some of the older stopes have caved and the ore remaining can be recovered only by stripping the overburden which is, generally speaking, on the south side of the cut.

By doing this much ore would become available at a cost which will admit of a profit on the operation. Late accounts from the mine state that stripping operations have actually been commenced, and the great cut will consequently be broadened and later deepened.

China is showing much interest in mining affairs, according to the *Far Eastern Review*. The government at Peking has directed the governor of Chinese Turkestan to investigate and report on the copper deposits of Kucha and Paichang with a view to developing them along modern lines.

The output of vanadium in the United States, according to statistics of THE MINERAL INDUSTRY, increased last year. In 1908 the production was 64,800 lb. ($162,000), while in 1907 it amounted to 41,000 lb. ($102,500).

The production of tin in Queensland during 1908 (*Queensland Gov. Min. Journ.*, April 15, 1909) was 4825 tons, valued at £342,191. This is a decrease of 315 tons, as compared with the production of 1907.

Automatic Dumping Skip for Vertical Shafts

Design and Operation of a Self Dumping Skip for Hoisting Either Rock or Water. Hoisting Mine Water Compared with Pumping

BY GEO. C. MC FARLANE*

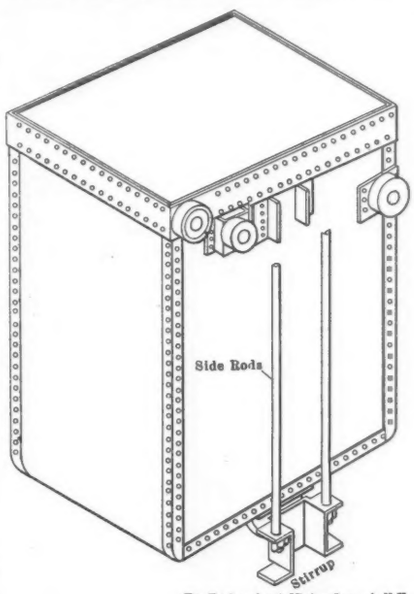
In the accompanying sketches, Fig. 1 illustrates a skip that can be used for hoisting rock and water from a vertical shaft. The body of the skip rests on a bottom axle, swung from stirrups that fit the guides and are suspended from the draw-head by side rods on either side of the guide strips. A couple of short angles riveted to the sides and just below the top binder form guide shoes to keep the skip vertical.

In case the skip only has to dump at one landing stage on top, two dumping rollers on a side and a dump track similar to that shown in Fig. 4 are all that is required. If it is desired to dump ore, rock and water at different landing stages at the surface, a three-roller dump and a cross-over style of dump guides like that shown in Fig. 2 will be required at all except the top dump.

The front and rear roller and the shoe angles project 2½ in. beyond the sides of the skip and the middle or outboard roller projects 4½ in. The side rods clear the sides of the skip 3 in. and at the dump the shaft guides are cut away to a depth of 2¾ in., so the shoe angles and rear roller can swing through side rods and shaft guides at the dump. If not used for hoisting men the skip can be coupled up short to the draw-head, but if it is desired to hoist men also, long side rods can be used so the men can stand upright on a light wood grating thrown across the top of the skip and grasp a hand rail bolted to each cross piece of the draw-head. Covers and safety dogs that dig into the inner face of the guides can be readily attached to the draw-head to make the skip safe for hoisting the men.

The object in designing this skip was to obtain a skip that would dump rock and water and also dump quickly. In this respect the skip is faster than the skip used in inclined shafts because the dump is positive and can be negotiated at high speed, throwing the load out square and clean and not slopping back in the shaft. In a sense it is a modification of the Russell type of self-dumping cage which has been used with good success in the Saginaw field for nine years. This type of cage is outlined in Fig. 5. The principal feature is the hook for raising the car doors as the car is tipped into the dump. The hook is pivoted between two pieces of flat iron about 5 or 6 ft. long suspended from a light cross-arm one end of which projects into the cageway. As the cage throws the car into the dump a roller on the hood of the cage strikes the cross-arm and raises the hook which has just entered a loop in the car door. The hook and cross-arm are steadied in place by light chain side guys. Should a car door jam and refuse to raise, the shank of the hook will swing through the flat bars that grip it and release the hook.

A self-dumping cage has only to swing through an angle of about 50 deg. to discharge its load; a skip, on the other hand, has to be swung at least 135 deg. to dump rock readily. By the addition of the outboard roller to the skip, it is prevented from swinging back in the shaft when it swings down below the horizontal. As the skip tips into the dump the outboard roller slides in under the guard rail and as the skip kicks back, the roller is canted up high enough to catch the outboard track and ride up it. With this device the skip can be over-wound 8 or 10 ft. without causing trouble.



The Engineering & Mining Journal, N.Y.

FIG. 1

Hoisting Mine Water

Where conditions are suitable, this kind of hoisting gear can be used for raising the mine water as well as the ore and waste. To bail water cheaper than it can be pumped, the rigging should be put in at the start of a new operation, and only in case it was reasonably certain that the shaft could be run down vertically and the workings laid out to drain the water to the shaft bottom by gravity. If it is necessary to put in field or auxiliary pumps to collect the water at the main sump there would be little economy in running bailers in the shaft.

In opening up steep pitching lode mines by vertical shafts the water could of course be easily drained to the main sump by gravity and in such cases the money usually spent in buying pumps, pipe, and a geared hoist, could be invested in a larger first-motion hoisting engine and balanced skips. The compartments should be large enough for 5¾-inch guide strips, i.e., a 6 x 6 in. strip, dressed on four sides. White pine or a similar fine straight-grained wood is perhaps the safest for guides, as the safety dogs have a better chance to gouge in and catch if the cable breaks. Hard maple wears smooth and is more durable than pine. The shoes and stirrups should fit the guides with not more than an ⅛ or 3/16 in. clearance. When the strips wear away ¼ in. new guides should be put in. If the guides are badly worn the skip will oscillate and wabble and not strike the dump square. As there is a good deal of side pressure on the stirrups as the skip is dumping, it is a good scheme to put 6-in. channels back of the guides at the dump. The guides should be given good alinement and preferably should be bolted through shims or spacing blocks so they can be easily straightened in case any of the sets take a slight squeeze.

Fig. 2 shows a cross-over arrangement of dumping guides, which permits of the skip discharging water just above ground level and by throwing the switch, ore or rock can pass through to a dump higher up in the shaft-house. When the switch is thrown back the skip is carried over the cut-away portion of the guides by two of the rollers, the outboard roller passing between the legs of the channel shown in the sketch. If it is desired to hoist a large volume of water, balance tandem skips can be used and unloaded in a two-way dump similar to the arrangment shown in Fig. 4, or longer bottom side rods can be used and both skips thrown one way. The lower skip can be fastened to the stirrups of the upper one by keying through the side rods and fastening the keys with cotter pins; then the bottom skip can be quickly detached and left in the sump and ore hoisted with the top skip. The horns of the water dump shown in Fig. 4 can be hinged to swing out of the way; then, by slipping in a filler in the cut-out of the guides, the

*Mining engineer, 312 Bearinger building, Saginaw, Mich.

ore loads can pass through to the ore dump.

Fig. 3 shows a sump arrangement by which single skips can be tipped and filled in the sump. To accommodate this layout the sump must be about 4 ft. wider than the rest of the shaft. Tandem bailers are ideal because they have enough weight to sink and fill over the rim, and they fill in a second, where a valve bottom bailer requires anywhere from 3 to 8 sec. to fill.

All the dumping tracks or guides shown in the sketches, except the switch, which is cast iron, are made of hardwood, ironed off with ¾-in. flat iron and securely bolted to the girths and buntons of the cageways. The patterns are struck off on a floor. First chalk down a line for center line of guide, then lay off a front dump circle of any desired radius, say from 12 to 20 in. Then make a templet of the skip showing axle, guide rollers and shoe angles. The back curve can now be scribed by rolling the templet on the front circle while keeping the axle center on the chalk mark that defines the shaft-guide center line. Care must be taken that the shoe angles clear the front circle.

Hoisting Water vs. Pumping

It is conceded that a water hoist is rather more economical of power that the average run of small mine pumps. This was brought forcibly to my mind a couple of years ago at a little mine in California. A pump was lifting water from the 300 level. When firing for the pump alone, I found it took a cord of dry pine wood, evaporating 1000 gal. of feed water, to pump 22,000 gal., or 92 tons of water. After resuming hoisting, I had the engineer of the night shift (on which no pumping was done) keep tab of the wood used, and found we were hoisting 80 to 90 tons of muck and ore from the 300 and 400 levels with a trifle over half a cord of wood; showing that the little hoist was nearly twice as efficient a machine as the mine pump.

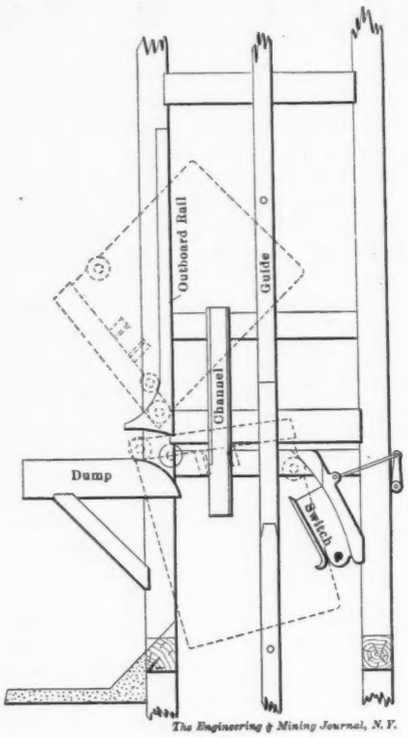


FIG. 2

A good hoisting engine, properly handled, has several advantages over a pump for lifting water. In the first place it has a small coefficient of internal friction. I have often noticed that the weight of a couple of men on one cage will start a (20-x 30-in.) first-motion balanced hoist when the brake is thrown off and the throttle is closed. As the cages alone weigh nearly two tons apiece, the friction loss must be very low. The engine, being close to the boilers, gets fairly dry steam. On the other hand, a pump has a big friction loss in the barrel, because the barrel gets scored more or less with even moderately dirty water, and the segments have to be screwed up tight against the packing to hold 10 or 15 ft. of vacuum. There is quite a loss in the long steam line both from pipe friction and condensation. In a long steam line with several elbows and other obstructions, the globules of condensed water also drag down the pressure of the steam, for every time they bunt into an elbow they nearly stop until again whipped up by the steam. Besides, there is a small per cent. of loss in the friction of the water column and more or less leakage through the valves.

In a mine depending on pumps to handle the water, one pump at least must

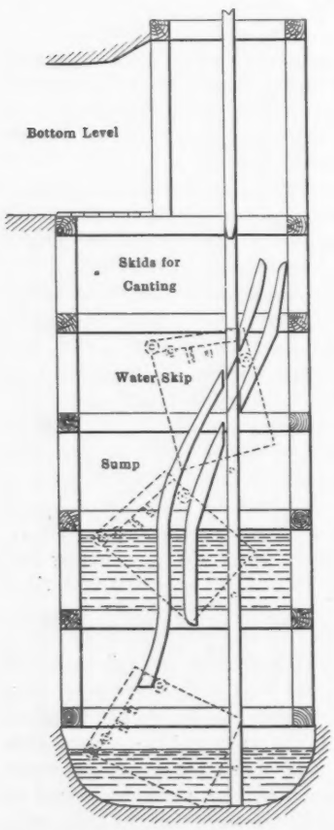


FIG. 3

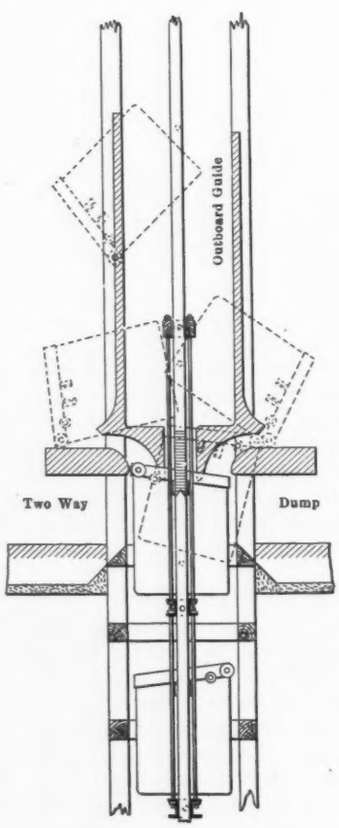


FIG. 4

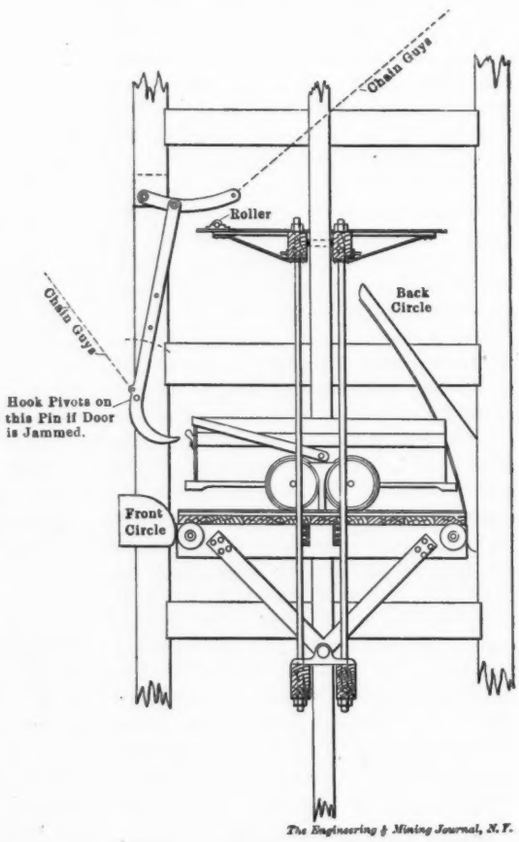


FIG. 5

always be kept in reserve, so that one of the others can be repacked and repaired.

If mine pumps are dispensed with, and the water raised with automatic bailers in connection with the regular ore and rock hoisting, there should be quite a reduction in the fuel used. The best feature of a water-hoisting plant, in my opinion, is that there need be no worry over flooding the mine should a big body of water be tapped or should the pumps be submerged by any accidental stoppage, such as the playing out of a boiler or a temporary interruption of the fuel supply. If the water temporarily gets the start of the water hoist, the engine can soon bring it down to the sump. Should the emergency arise, I am satisfied a good first-motion hoist with tandem bailers could pull water at a tremendous rate, because the skips will fill and dump almost in a second and as there is plenty of leeway on which to stop, the engine could be run at high speed.

I have occasionally timed engineers, who could pull a car of coal from the bottom and put it into the dump in from 9 to 11 sec., a distance of 250 to 275 ft., and there would be only about 12 in. to play on at the dump. I noted one hoist runner a few years ago who handled the engine almost entirely with the reverse lever when the coal was coming fast. At the tap of the bell he would throw it over and hook it on center before the cage shot into view above the ground level. As the tipple floor was 50 ft. above the ground the cage traveled on its own momentum possibly 60 or 70 ft. Of course the descending empty cage helped it along some, but even allowing for the velocity of the falling cage, the load must have been traveling at the rate of 40 ft. per sec. in the middle of the hoist.

In these shafts the guides did not vary ¼ in. from the perpendicular in their entire length. If the shaft is crooked or has a couple of short kinks in it, it would not be advisable to attempt high-speed water bailing. When a hoist is operated at a fairly high speed and handled mainly with the reverse, it is a very efficient machine. Wire drawing the steam with the throttle and chocking the engine off with the brake and stopping 15 or 20 sec. between winds, allowing the cylinder to cool off, cuts its efficiency down quite perceptibly.

Sampling Ores from the Cobalt District

A. A. Cole (*Can. Min. Inst.*, 1908) describes the sampling of the silver-cobalt ores from the Cobalt district, Ontario, as practised at Copper Cliff. The difficulty in sampling these ores is caused by the occurrence in them of large amounts of metallics composed of native silver or silver-arsenic alloys. The ore is usually shipped from the mines in bags and is weighed in drafts of 10 bags each as it is unloaded from the cars. The contents of the bags are dumped into a Buchanan jaw crusher and the bags weighed for taring purposes.

One small shovelful representing each sackful is taken of the crushed ore as a moisture sample. This moisture sample is coned and quartered to about 100 lb., and then crushed with a small Allis-Chalmers laboratory jaw crusher. Four samples of about 11 lb. each are then cut out and dried in a steam oven for about 20 hours at a temperature of about 80 deg. Centigrade.

All of the moisture sample is returned to the main portion and the whole passed through an Allis-Chalmers ball mill. In case the ore is wet it undergoes a preliminary drying on steam-drying plates before being fed to the ball mill. The balls in this mill are of hardened steel and have a weight of 1¾ tons. The ore is ground until it passes a 20-mesh screen, sieving tests showing that 50 per cent. will pass a 100-mesh screen and 80 per cent. a 50-mesh screen. The capacity of the mill is 1.5 tons per hour.

One-tenth of the ore as it is discharged from the ball mill is cut out by a 27-in. Snyder automatic sampler. The sampler is chain driven to prevent slipping and makes 25 r.p.m., giving 3000 cuts per hour for 1.5 tons of ore, or one cut for every pound of ore. The sample and rejected portion are weighed and this weight less the moisture is used in settlement. The original weight less moisture should check this latter weight and as a rule does. The moisture sample on the milled ore is obtained by taking a portion from each pailful of the sample by means of a tube sampler.

The main sample is mixed on the concrete floor of the sample room by shoveling it over twice. After coning and quartering once, the two halves obtained are treated as independent samples. Each of these samples undergoes the same treatment. They are first cut down by coning and quartering to about 100 lb. From this point the cutting down is done with a Jones sampler until two portions of about 20 lb. each are obtained. One of these portions is sealed up as a reserve sample and the other thoroughly dried and ground in a Sturtevant disk grinder until the fines pass through a 100-mesh screen, leaving the metallics bright and clean on the sieve. Sometimes an Abbé pebble mill and a Hance drug mill are used to assist in the grinding. The metallics and fines are weighed and sampled separately, the fines being first mixed by an hour's revolution in the pebble mill. The large metallics that remain in the large ball mill are removed at the end of the run, weighed and melted into bullion. The resulting bullion, slag and speiss are weighed and sampled, the slag and speiss being sampled together.

The time of sampling is three days for a 30-ton lot. The results should be accurate as the method is based on the best practice.

London's "Kafir Boom"

"The revival in Kafir shares," writes a Stock Exchange correspondent to the London *Economist*, "which has led to the present boom among nearly all the sections of the South African market, may be ascribed in part to the East Rand Proprietary Mines, Ltd. It is less than a year ago that the East Rand consolidated the six subsidiaries, Driefontein, Angelo, New Comet, Cason, Cinderella and New Blue Sky Companies, together with the H. F. Company, the Angelo Deep, the Hercules, part of the Driefontein Deep and various other claims and interests. This necessitated the increase of the capital to £2,500,000, of which £2,405,897 was issued, the total number of shareholders being something like 16,000 people.

"The amalgamation, pioneer of the many which have since become so popular, rather staggered the market, and the advantages claimed for it were by no means generally conceded. But the monthly output from the consolidated company left no room for doubts, at any rate, as to the immediate wisdom of the policy. The profits for each of the past four months, from January to April, have been returned at £101,064, £101,666, £103,892 and £104,289, a total of £410,911, or at the rate of £1,232,733 for the year, without taking into account progressive expansion, such as the character of the figures just quoted may justify.

"That such statistics have had a great effect in assisting in the production of the Kafir boom nobody will question. The successful carrying through of the East Rand amalgamation gave the signal for the launching of various other similar schemes, which have certainly played their part as factors in the market revival. The boom progresses, and the coming settlement will be one of the heaviest the Kafir market has been since the pre-peace days of January-June, 1902. The provinces have been large buyers, the Germans and the French even larger, and the Continental purchases are mostly lifted from the market—not carried over—thereby affording very material support.

"Members and their clerks declare they are worked to death. Small fortunes are amassed by jobbers in a week, although the dealers bewail that prices are so close nowadays that their former profits of 1005 have shrunk to sixty-fourths of what they were in that year of famed, if notorious, memory. Yet money can be lost quickly, even now. A dealer, making a shilling price to a broker in a couple of thousand shares in which there is a very free market, lost £490 over the transaction, the price moving against him before he had time to undo the bargain."

Coal Mining in Central West Virginia

A Brief Study of General Conditions, and Details of Operation at the Coalton Mine, Which Plant Is Typical of Mines of the Region

BY FLOYD W. PARSONS

During the recent midsummer session of the West Virginia Coal Mining Institute, held at Elkins, W. Va., the members present were afforded an opportunity to visit the Coalton plant of the Davis Colliery Company, situated on a branch of the Coal and Coke Railroad, a few miles south of Elkins. Although the general operation of this plant does not differ greatly from the general working of many other bituminous mines, the development here carried on is typical of conditions existing throughout this central district, so that a brief description of prevailing conditions and methods will not be out of place.

Because of the lack of adequate transportation and the general inaccessibility of the country, central West Virginia was the last portion of that State to undergo development. The presence of a thick seam of coal in the "Roaring creek" region was known before the Civil war. A block of coal from this district was exhibited at the Centennial in Philadelphia, in 1876. This last mentioned coal was hauled by wagons from a point located about two miles from the Coalton plant. The exact spot from which the block came, is, in fact, within a rod of the cabin in which General McClellan made his headquarters during the Rich Mountain battle. The coal exhibited at the Centennial was in two blocks, each 5 ft. thick, and many were incredulous that a seam of coal 10 ft. thick existed in the Roaring Creek region.

While the presence of this field was known to some and rumored among others, the country was inaccessible until the completion of the Belington branch of the West Virginia Central Railroad. At that time, Senator Henry G. Davis and his associates owned the West Virginia Central. The first commercial mine in the roaring Creek region was at Junior. This mine was started by H. G. Davis, Jr., being known as the Junior Coal Company, with 84 acres of coal land. The name, Junior Coal Company, was used until about six years ago, when the title was changed to the present one of Davis Colliery Company.

The Davis Colliery Company now owns more than 20,000 acres in the heart of

GENERAL VIEW OF 1800-TON STEEL SLACK BIN, INCLINED STRUCTURE FOR ROBINS BELT CONVEYER, AND CHAIN-HOIST LEADING TO TIPPLE AT THE COALTON MINE

the Roaring Creek field, as well as being the operating company for the holdings of the Coal and Coke Railway, which amounts to 100,000 acres.

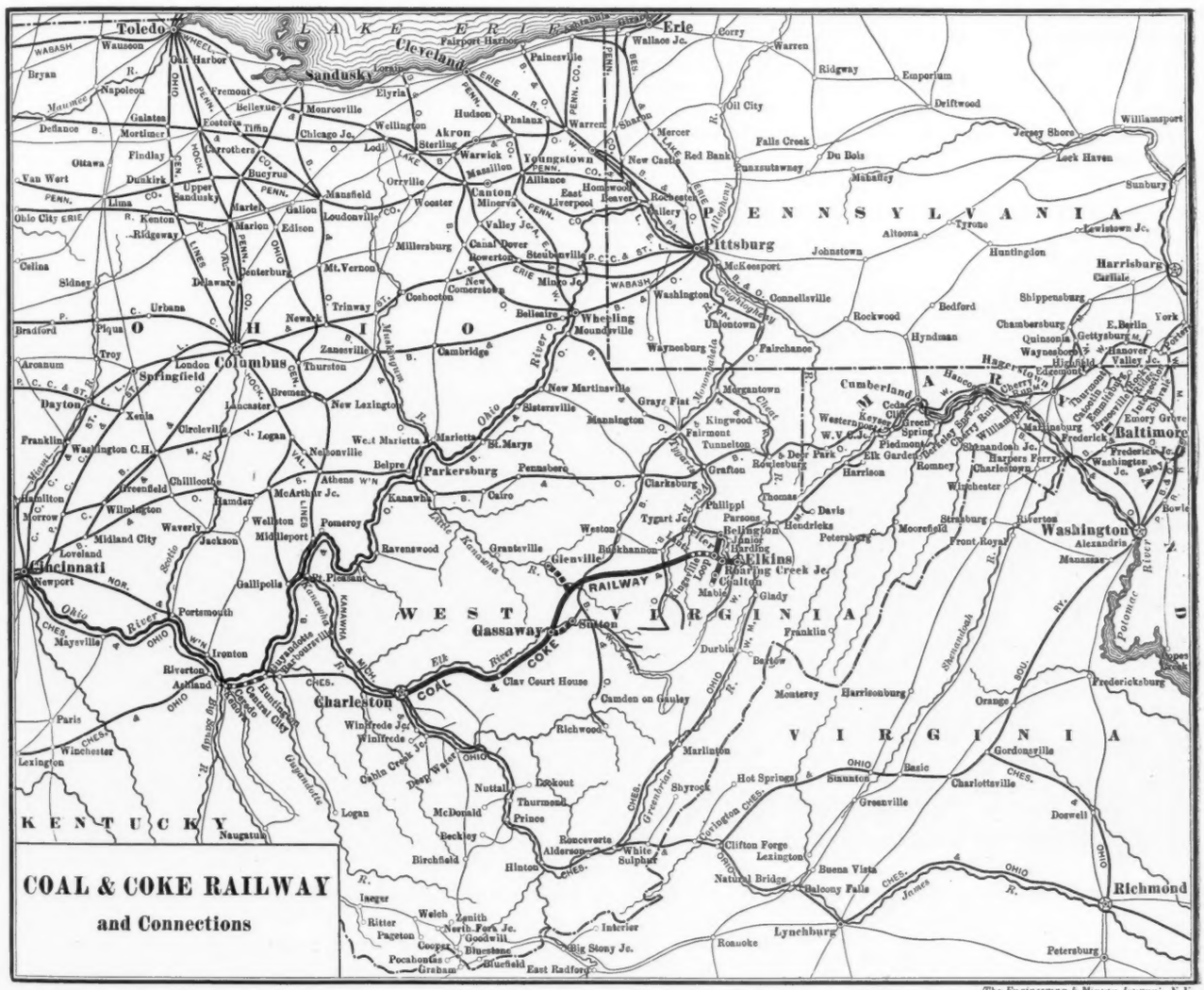
The Coal and Coke Railroad

The entire line of the Coal and Coke Railroad was completed and put in operation June 30, 1907. The road extends from Charleston to Leiter, a distance of 166 miles; and from Belington to Mabie, W. Va., 17.7 miles. The company was incorporated May 14, 1902, under the laws of West Virginia, and on Aug. 11, 1903, purchased the Charleston, Clendennin and Sutton Railroad, extending from Charleston to Otter, W. Va., 63.6 miles. The accompanying map shows the connections of the Coal and Coke Railroad, and the general location of the Elkins and Roaring creek field, with reference to Eastern, Northern and Western markets.

In reaching the Western market, the coal mined by the Davis Colliery Company is generally shipped to Charleston and proceeds from there west over the Chesapeake & Ohio railroad. The Eastern outlet is over the Western Maryland (formerly the West Virginia Central). Some coal is shipped to distant points over the Baltimore & Ohio Railway.

In this connection, a brief history of the Western Maryland Railroad may be of interest. This road was incorporated by special act of the General Assembly of Maryland, May 27, 1852, under the name of Baltimore, Carroll & Frederick Railroad Company, which name was changed to Western Maryland Railroad Company in March, 1853. In 1902 the company acquired control of the West Virginia Central and Pittsburg Railroad Company, operating railroads and extensive coal properties in West Virginia.

The West Virginia Central retains the ownership of all its coal properties and mining operations, but its entire capital stock is owned by the Western Maryland Railroad Company. This latter company, therefore, owns or controls about 135,000 acres of coal land, 107,000 acres of which are located on the lines of its West Virginia division, and about 30,400 acres on the lines of the Baltimore & Ohio Railroad. On these lands there are some 26 mining plants and more than 1000 coke ovens; also administration buildings, department stores and more than 600 dwellings. The Davis Coal & Coke Company is the operating and sales agent for the Western Maryland coal properties. The amount of the authorized capital stock of the Western Maryland Company is $60,000,000. The preferred stock has been canceled.


COAL & COKE RAILWAY
and Connections
L A K E E R I E
P E N N S Y L V A N I A
O H I O
W E S T V I R G I N I A
V I R G I N I A
K E N T U C K Y
Toledo
Cleveland
Erie
Sandusky
Pittsburg
Columbus
Springfield
Cincinnati
Parkersburg
Gassaway
Elkins
Charleston
Clay Court House
Camden on Gauley
Hinton
Ronceverte
Lewisburg
Alderson
White Sulphur
Clifton Forge
Lexington
Buena Vista
Natural Bridge
Balcony Falls
Richmond
Lynchburg
Roanoke
Peterburg
Washington
Baltimore
Cumberland
Harrisburg
Williamsport
Jersey Shore
Lock Haven
Sunbury
Altoona
Johnstown
Huntingdon
Bedford
Rockwood
Connellsville
McKeesport
Uniontown
Waynesburg
Fairchance
Wheeling
Steubenville
Zanesville
Cambridge
Newark
Mansfield
Akron
Canton
Youngstown
Warren
Oil City
Emporium
Driftwood
Du Bois
Punxsutawney
Mahaffey
Falls Creek
Red Bank
New Castle
Beaver
Rochester
Pittsburgh
Grafton
Clarksburg
Fairmont
Morgantown
Kingwood
Tunnelton
Deer Park
Oakland
Piedmont
Keyser
Romney
Harrison
Elk Garden
Shenandoah Jc.
Harpers Ferry
Charlestown
Winchester
Strasburg
Front Royal
Riverton
Moorefield
Petersburg
Davis
Thomas
Hendricks
Belington
Junior
Hardrock
Coalton
Glady
Mabie
Durbin
Bartow
Franklin
Monterey
Harrisonburg
Orange
Fredericksburg
Alexandria
Manassas
Gordonsville
Charlottesville
Doswell
Basic
Staunton
Hot Springs
Shyrock
Greenville
Marlinton
Richwood
Cabin Creek Jc.
Deep Water Jc.
Nuttall
Dorothy
Thurmond
Prince
McDonald
Beckley
Birchfield
Logan
Naugatuck
Winifrede Jc.
Winifrede
Ashland
Ironton
Portsmouth
Gallipolis
Pomeroy
Middleport
Wellston
Jackson
Ravenswood
Point Pleasant
Kanawha
Cairo
Belpre
Marietta
Nelsonville
Athens
Chillicothe
Greenfield
Hamilton
Dayton
Xenia
Lancaster
Thurston
Logan
Circleville
Washington C.H.
Delaware
Mt. Vernon
Coshocton
Trinway
Millersburg
Orrville
Wooster
Loudonville
Mansfield
Galion
Marion
Bucyrus
Upper Sandusky
Findlay
Lima
Kenton
Ridgeway
Bellevue
Fremont
Elyria
Lorain
Wellington
Hudson
Phalanx
Warwick
Massillon
Alliance
Minerva
East Liverpool
Homewood
Denver
Gallery
Valley Jc.
Canal Dover
Newcomerstown
Monroeville
Chicago Jc.
Lodi
Sterling
Akron
Defiance
Mortimer
Galatea
Van Wert
Dunkirk
Ottawa
Celina
Sidney
Urbana
Piqua
Troy
Arcanum
Bradford
Greenville
Union City
Ohio City
Wauseon
Bryan
Napoleon
Oak Harbor
Fairport Harbor
Painesville
Wallace Jc.
Corry
Warren
Ridgway
Sharon
Mercer
Lake
Shenango
Allegheny
Kiskiminetas
Conemaugh
Loyalhanna
Youghiogheny
Monongahela
Cheat
Potomac
Shenandoah
Rappahannock
Rapidan
Hazel
Tygart Jct.
Philippi
Parsons
Bellington
Junior
Hardrock
Coalton
Glady
Mabie
Durbin
Bartow
Franklin
Monterey
Harrisonburg
Orange
Fredericksburg
Alexandria
Manassas
Gordonsville
Charlotts

Moisture	0.70
Volatile matter	29.30
Fixed carbon	61.19
Ash	8.81
Total	100.00
Sulphur	1.48
Phosphorus	0.032
B.t.u.	13,850

An average analysis of the coke made at the Coalton ovens, after burning 48 hours, shows:

Moisture	0.11
Volatile matter	0.82
Fixed carbon	83.44
Ash	15.63
Total	100.00
Sulphur	1.13
Phosphorus	0.038

A. P. Brady, of the West Virginia Geological Survey, reports the following structure for the Lower Kittanning coal near Coalton:

	Ft.	In.	Ft.	In.
Coal	0	1		
Bone coal	0	2		
Coal	2	2		
Slate	0	1½	7	7½
Coal	3	4		
Slate	0	3		
Coal	1	6		

The butts run south 80 deg. east; faces, south 10 deg. west, and the greatest rise of the seam in this district is south 30 deg. east.

Production of a Clean Coal

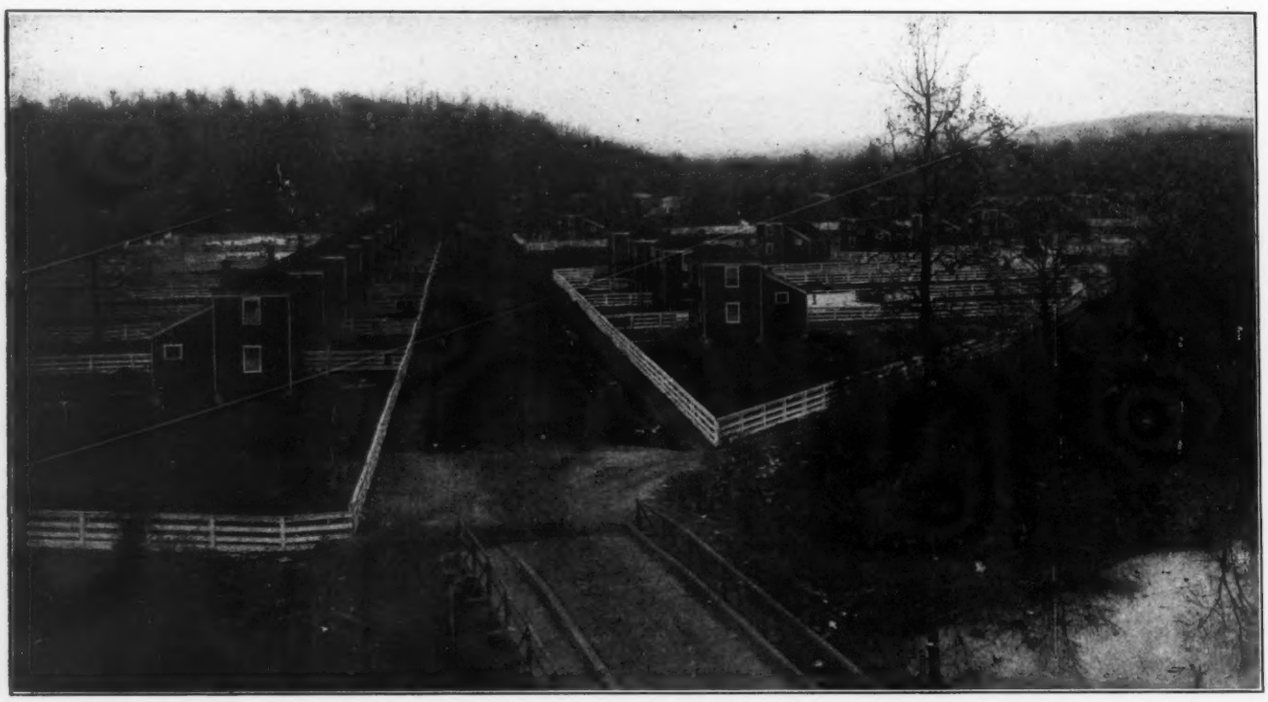
The great problem at the Coalton mine, as well as at other plants in central West Virginia, is to produce a fuel having a small ash content. Thousands of dollars have been spent in experimenting with this end in view. This does not mean that the coal here mined is inferior in quality; on the other hand, if the coal here developed were located in certain Western States, it would be considered an unusually valuable fuel; however, having to compete with such coals as those produced in the New River and Pocahontas fields, the operators who mine the Kittanning and Freeport seams in central West Virginia have a task that is not easy. Coal washeries are not as generally used in northern and central West Virginia as the nature of the coal here mined justifies. Two causes are responsible for this condition: First, the fuel produced answers very well, without washing, for the specific purposes to which it is put; second, there is an excessive productive capacity causing fierce competition which has placed the industry on a basis where only unavoidable expenditures are possible.

Conditions that have existed in southern West Virginia are largely responsible for the present depressed state of the coal trade and its slow recovery. In this latter district a quality of coal unsurpassed anywhere in the world lies practically at tipple hight, and is mined at a minimum cost. However, from the very beginning, the operators in southern West Virginia have been practically unorganized and have fought bitterly for the business of all accessible markets. The coveted trade has been practically controlled by the large consolidated interests in older fields, and the aggression of the small independent operators in southern West Virginia has been hotly contested. As a consequence, while wages and the price of commodities in general have advanced during a period of years, the price of coal has either remained stationary, or been held at a level that not only prevents any preparation, such as washing and picking, but also has caused operators to mine their coal in the quickest and most reckless manner.

The severe depression in business that we have just passed through has taught a lesson that will not be forgotten immediately, and it is to be hoped that one result will be a better organized coal industry, with prices raised to a basis that will net operators a fair return on their investment, thus permitting the adoption of sensible and efficient mining methods, and making possible the introduction of such safety precautions as have been proved of practical benefit.

West Virginia, with a productive coal area of nearly 10,000 sq.m., and an estimated coal supply of more than 60,000,000,000 tons receives a return in net profit that is ridiculously small when compared with the value of her rich heritage. Large coal companies in this State have recently made long contracts to deliver coal at their mines for 60c. per ton. With an actual labor cost approximating 45c. per ton, it is not hard to figure where the coal operator is going to get off.

Mining men in the United States are now evincing an interest in the methods used abroad and the equipment of European mines, and some have gone so far as to suggest that American mines could be made to compare favorably with those in Europe; however, such plans cannot be consummated here while present conditions exist. Tiled floors and stained-glass windows in the power house of a Continental colliery are possible with coal at $2.30 per ton, but not possible in the



VIEW OF COMPANY HOUSES AT THE COALTON MINE OF THE DAVIS COLLIERY COMPANY. THESE HOUSES RENT AT $6 TO $9 PER MONTH

United States with our product selling at the mines for 70 or 80c. per ton.

The Coalton plant of the Davis Colliery Company is one of the best equipped porperties in central West Virginia. This mine was purchased by the present owners from other interests who knew the property as the Wormelsdorf plant. The early owners did not develop the mine in a systematic manner, and, as a consequence, the left side of the underground workings was subjected to a number of squeezes which resulted in the loss of considerable coal.

Surface Equipment at Coalton

The Davis Company has provided 102 houses for its Coalton employees. These houses are of the five- and six-room variety; 78 are ceiled, and 24 plastered. A few of the plastered houses are built of brick. The rents vary from $6 for a five-room wooden-ceiled house to $9 for a six-room plastered brick house. The general design of these buildings may be noted in the accompanying illustration. The company's department store is of the usual type common to coal mines. Scrip is issued and is accepted as cash for all purchases.

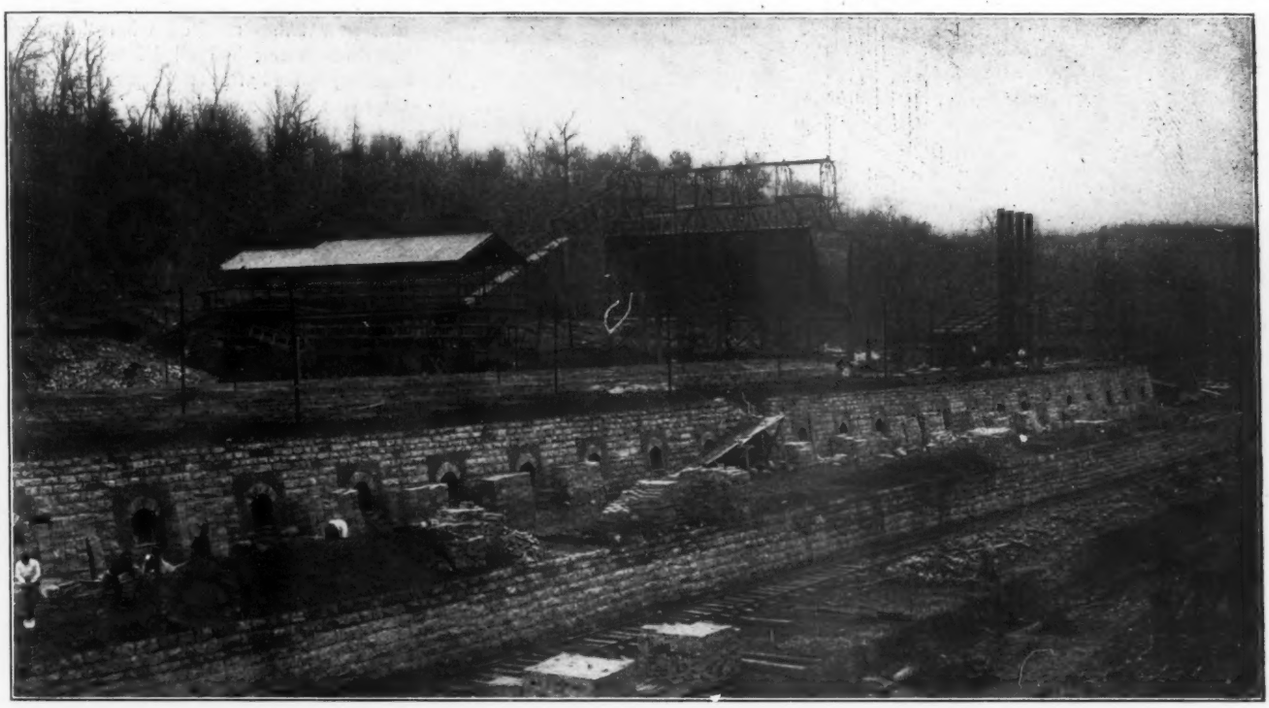
A Unique and Simple Arrangement

The mine barn is a substantial and commodious structure, far better than the average mine stable. The most unique feature in connection with the barn is a simple arrangement for mechanical feeding. The grain and hay are kept in bins on the second floor; on this upper floor and directly over the feed box of each stall is a bucket-shaped metal vessel having a horizontal-slide bottom. The bottom of each of the feed buckets is connected to a cable running on pulleys in such a way that the slide bottom remains open when no mechanical force is exerted. The stableman can close all of the boxes by pulling down on the cable which runs over a pulley and hangs down alongside a post. A ring is attached to the end of the cable, and when the latter is pulled down a sufficient distance to close the bottoms of the feed buckets, a long steel pin is extended through the ring on the cable, and the end of the pin, which is pointed and straight, is placed underneath a nail driven in the side of the post.

Directly alongside this same post and on a shelf at about the same elevation as the nail which catches the pin and holds down the cable, an ordinary alarm clock is placed. The other end of the pin, that holds down the cable, is fastened to the key that is used to wind the alarm on the back of the clock. This alarm can be set for any specified time, so that at the desired moment the alarm starts to ring, the key on the back of the clock revolves, the pin is pulled away from contact with the nail in the post, thus releasing the cable and allowing the bottoms of the feed buckets to slide open, dropping the grain into the manger in the stall below. This simple arrangement enables the stableman to set his alarm for any hour, then fill his feed buckets and leave the stable, feeling sure that at the proper time the feed will be dropped to the animals in the stalls below. It is stated that the moment the alarm rings, all of the mules quickly step back, knowing that the feed is going to drop from above.

The Coke Ovens

At the Coalton plant there are 200 ovens, arranged in two blocks of 100 each. These ovens are of the ordinary beehive type, with the floor in the ovens falling to the front on a slope of 7 in. in 12 ft. The bottoms of the ovens formerly were built with an incline to the front of 5 in., but this slope was found insufficient to insure a quick drainage of the water used for cooling the coke. The net tonnage of each oven is about 3.8, while the coke output averages 73 per cent. Everything that goes through a 1¼-in. screen is crushed by a Williams hammer crusher, and is used in the manufacture of coke.



GENERAL VIEW OF COKE OVENS AT THE COALTON MINE, ALSO SHOWING THE STEEL SLACK BIN, TIPPLE AND POWER HOUSE DURING CONSTRUCTION

The Williams crusher has given excellent service. This machine takes anything up to 1½ in. in diameter, and although small pieces of steel go through almost every day, the crusher has not been disarranged or broken.

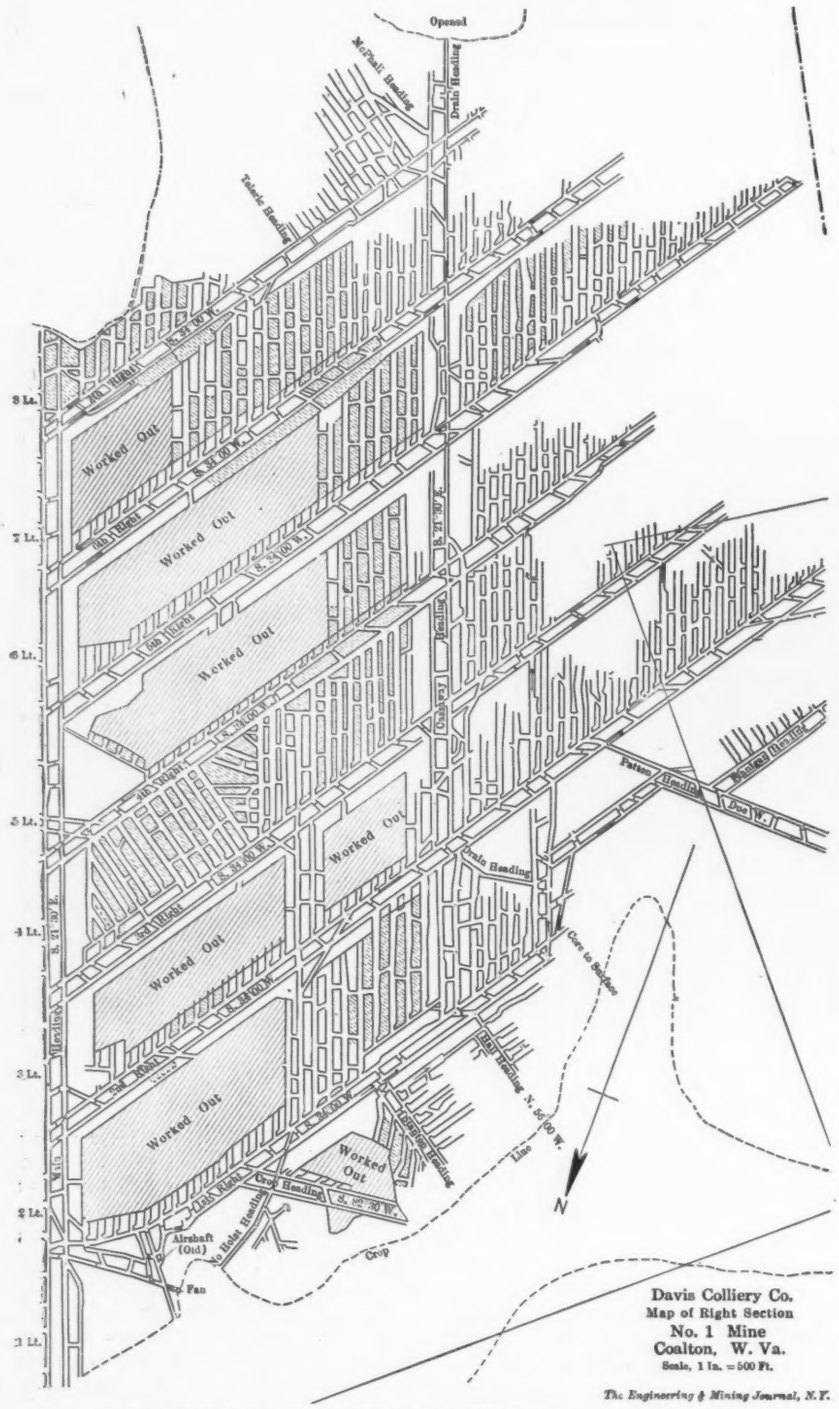
The Steel Bin

The most interesting feature at the Coalton plant is the 1800-ton steel bin that was manufactured and installed by the Fairmont Mining Machinery Company. This bin is made entirely of steel and is shown in the accompanying illustration. The bin feeds into a 7-ton electric larry which supplies the ovens located nearby.

The underground development carried on by the Davis Colliery Company, at this mine, has been carefully planned and well executed, as is shown by the accompany-

ing mine map. All entries and rooms are driven on centers, so that an effort has been made to leave uniform pillars, and thus prevent a loss of coal through the occurrence of any unnecessary squeezes.

The average thickness of the seam is reported by the superintendent as 10 ft.; in some places, the coal shows a thickness of 14 ft.; as a general rule, only about 7 ft. of the seam is mined. The nature of the coal is such that up to the present time, all mining has been done by pick, and no machines used. It is probable that in the near future experiments will be made to see whether machines cannot be successfully introduced. Electric underground haulage is used and two General Electric, 7½-ton locomotives and one 13-ton locomotive of the same make, are employed. On the main entry 60-lb. rails are used, while 40-lb. steel is placed on cross entries. A current of 500 volts is carried in the mines. Such a voltage in some districts would be considered dangerous but it is common in many West Virginia coal mines. No serious accidents have happened from shock.



AN EFFORT IS MADE TO ROB PILLARS IMMEDIATELY, SO THAT PRACTICALLY ALL THE COAL IS SECURED ON THE ADVANCE

Mining Methods

The underground problems that have so far been encounterd are simple in the extreme. The mine is fairly damp and non-gaseous, so that the constant problem of eliminating dust and gas explosions is not the uppermost question. Notwithstanding the fact, however, that such safety prevails, the ventilation is carefully conducted and is said to be ample at all times. A 20-ft. Robinson fan provides the air circulation at present. This ventilator is 8 ft. wide, and is steam-driven, running at 60 r.p.m. This same fan was formerly driven at 100 r.p.m., and delivered no more air at the face than it does at present. The improved conditions that now exist resulted from the management having had all inside stoppings carefully looked after and repaired. These stoppings are now built 5 to 8 in. thick, and are made of a material, composed of 20 per cent. cement and 80 per cent. coke cinders.

The dip of the seam is such that all drainage is natural and is accomplished by a network of ditches. The rooms are driven on about 50-ft. centers, and are 20 to 28 ft. wide. The entries are protected by small barrier pillars; these latter are not as large as is usually the case in a coal of this character and they are not kept intact, as is shown on the accompanying map.

The prevailing method is to take the pillars back immediately, drawing them on an angle of about 45 deg., and the general scheme at Coalton is to secure as high a percentage of extraction as is possible on the advance, rather than to develop the mine and extract the pillars retreating. Although in a majority of cases this plan is ill-advised and results in a final loss of coal, conditions here are somewhat different, and it must be remembered that only about two-thirds of the seam is mined, which provides a coal roof of considerable strength.

Preparation of the Coal

After the coal is mined and hauled to the room partings by mules, it is then made up into trips and hauled by motors to the foot of the slope near the mouth of the mine. The cars are here dropped, one by one, to a swag at the bottom of the incline, where each car is engaged by a dog on the chain-haul which hoists the coal to the tipple floor above; from here each car runs by gravity to the Phillips cross-over dump where the coal is shot onto the screens, and the empty car runs by gravity through a spring-latch switch and is lowered back into the mine.

The mechanical hoist that raises the cars from the mine to the tipple was also built by the Fairmont Mining Machinery Company, and has given good service.

The dogs on the chain are arranged at 16-ft. centers; the car hoist is 70 ft. long, with a 21-ft. lift. The hoist is driven by a General Electric 30-h.p. motor.

After the coal is dumped onto the screen, all sizes greater than 1¼ in. go over other screens and the coal is further separated into nut, lump, etc., or the entire product is shot into the railroad cars without any additional screening, and is then sold as screened run-of-mine. As before stated, the undersize (all under 1¼ in.) goes to the Williams crusher and is pulverized. This fine product is then elevated on a belt conveyer (the housing and incline of which are shown in the illustration) to the top of the 1800-ton steel slack bin. This belt conveyer carries the slack satisfactorily, but is too steep to carry nut coal. The belt conveyer here used is of the Robins type, 360 ft. long, with a lift of about 130 ft. A 60-h.p. General Electric motor drives this conveyer.

COAL TIPPLE AT THE HARDING MINE OF THE DAVIS COLLIERY COMPANY.
A STYLE OF DESIGN COMMON TO WEST VIRGINIA

The design and erection of the steel tipple at the Coalton mine was also executed by the Fairmont Mining Machinery Company. The arrangement of the shaker screens does not differ materially from the general run of tipple installations. The screens are driven by a 30-h.p. General Electric motor.

The miners at this and other plants in the district are principally foreigners, and, as in other West Virginia fields, they are unorganized. Wages in Central West Virginia do not differ materially from those paid in other parts of the State. A miner receives 80c. for a 2-ton car, which is practically the same as that paid in the Fairmount region.

All members of the West Virginia Coal Mining Institute who visited the Coalton plant are greatly indebted to C. S. Robb, general manager of the Davis Colliery Company; J. F. Healy, general superintendent, and F. C. Cornet, chief engineer.

There are few engineers at present who contend that direct-current is as safe as three-phase current in gassy mines.

Aluminum in Japan

W. T. Preston, Canadian trade commissioner in Japan, reports to the Canadian Department of Trade and Commerce that though an aluminum factory was started in Osaka recently, practically all the aluminum used in Japan comes from foreign countries. The importation of aluminum has increased from 83,879 lb., valued at 36,703 yen in 1901 to 2,445,403 lb., valued at 1,803,217 yen in 1907. Ten years ago the demand for this metal was quite limited, the sudden increase being caused by the adoption of military equipment made from aluminum, by the army authorities seven years ago, followed by its use for cooking utensils. If the cost of material continues to be as moderate as at present the prospects are favorable for a great expansion in the manufacture. An active demand for aluminum ware exists in China, and large orders have been received for soldiers' conveniences for the Chinese army.

The duty on sheets and manufactured wares being high as compared with the duty on slabs and ingots, it is more profitable to manufacture sheets and wire in Japan from the imported raw material. There are many small manufacturing establishments now engaged in turning out sheets and wire, as well as a couple of large factories in Osaka engaged solely in manufacturing aluminum wire. Under these circumstances it may safely be said that the demand for ingot aluminum will increase, while the importation of sheets and wire will undoubtedly decrease. The ingot must be composed of aluminum 98.5 cent. pure. The imports of aluminum under the heading of ingots, slabs and blocks in the customs statistics for 1907 show that Belgium headed the list with 511,469 lb., valued at 387,659 yen ($193,829), closely followed by Germany with 502,198 lb., valued at 348,984 yen ($174,492); the third being Great Britain with 233,276 lb., valued at 167,251 yen ($83,625).

Canadian exports of aluminum in bars, blocks, etc., for the fiscal year 1907, amounted to 4,981,600 lb., valued at $1,048,533. Mr. Preston points out that the largest customers for the Canadian output —Belgium and Great Britain—are extensive sellers to Japan, and that there is a wide difference between the prices at which Canada sold and those which Japan paid. The export price from Canada in 1907 was $18.79 per 100 lb. The cost of aluminum imported into Japan the same year was $39.57 per 100 lb., the difference of $15.78 per 100 lb. being too large to be swallowed up in freight and other importation charges.

The Namaqua Copper Company

The report of this South African company for 1908 states that operations were conducted without profit to the shareholders owing to the low price of copper ruling throughout the year. In previous years the company has paid good dividends, having distributed as much as 40 per cent. on the capital in 1899.

During 1908 there were 46,200 tons of ore from the mines and dumps dealt with, producing 2335 tons of fine copper, against 42,400 tons of ore in 1907 producing 2432 tons fine copper. The reserves of ore in the mines and at surface are estimated at 115,204 tons, carrying 7985 tons of fine copper. There is also a reserve of slimes and tailings suitable for retreatment estimated at 84,729 tons, value not stated.

The two furnaces at the smelting works were kept in regular operation except during November and December, when the wreck of a coke ship caused a shortage of coke and the furnaces had to be shut down.

All fines from the ore, as well as concentrates, slimes and a portion of old jig tailings, are now briquetted and a much larger portion of this class of material has been charged in this form, whereby a reduction in loss by dust is secured.

The Elmore vacuum oil plant was in operation up to June 27, when it was shut down, the results obtained not warranting the running of the plant under the conditions then prevailing. The quantities treated by this process were 1639 tons of 2.81 per cent. copper, which produced 83.5 tons of concentrates containing 31.71 per cent. The extraction, therefore, was slightly over 57 per cent.

In the Tweefontein mine No. 1 shaft was deepened 233 ft. to a total depth of 1140 ft. No. 2 shaft was deepened 114 ft. to a total depth of 750 ft., with more encouraging results than in No. 1. Development work and stoping were also carried on in the Wheal Julia mine. Work in the new Prospect mine was closed down at the end of March, as reduced price of copper made it inadvisable to continue working on the narrow lode and low-grade ore that were met.

Colliery Notes

One volume of firedamp is sufficient to reduce the whole of the oxygen present in nine volumes of air to carbon dioxide and water, and less than 6 per cent. will propagate a flame.

Power gas is produced by passing quantities of air and steam through incandescent fuel. This gas consists largely of carbon monoxide and is used for power and heating purposes.

It should be remembered that it requires no more than 3 grams of coal dust per cubic foot of air to give the requisite quantity of carbon to reduce the whole of the oxygen present to carbon monoxide, or a proportion by weight of 1 of dust to 13 of air.

Coke that is to be used for the manufacture of iron or for other metallurgical purposes, should be firm, tough and light, and should have not more than 1 per cent. of sulphur. For blast-furnace purposes, dense coke is not so good as those varieties possessing large cell structure and hard cell walls.

At one colliery where it was decided to experiment with water, as a means for preventing dust explosions, a large spray was thrown right across the roadway. The officials expected that this spray would dampen the air sufficiently to insure the dust being laid for a considerable distance. They were surprised, however, to find that the effect of the spraying was lost after the air had traveled 1500 feet.

Coal gas, such as is manufactured and used in various towns and cities for lighting purposes, is produced by the distillation of coal out of contact with the air. This gas is composed of the following elements or compounds, in about the proportion named: Carburetted hydrogen, 40 per cent.; hydrogen, 30 to 35 per cent.; carbon monoxide, 6 to 8 per cent.; carbon dioxide, 3 to 4 per cent.; oxygen, 3 to 5 per cent.; nitrogen, 7 to 8 per cent.

It was formerly the general opinion that the dust lifted by the ventilation and lodged on the bars and other ledges in a mine was the most readily combustible and dangerous; however, more recent observations have shown by analysis that the dust lodged on the higher ledges, near the roof, generally contains a much greater proportion of ash, as compared with that either from the screens or from the roadways, and less volatile combustible matter.

According to a bulletin, recently issued by the United States Office of Public Roads, the application of calcium-chloride solution to a macadamized road near Washington resulted satisfactorily in laying the dust. Of the commercial salt, 600 lb. were used, dissolved in water in the proportion of 1 lb. to 1 gal. of water. The solution was applied five times during the summer over 1582 sq.yd., at a total cost for the season of about 2c. per sq.yd. The bulletin states that although much traversed by motor cars, the treated roadway was kept free from dust and became smooth and compact.

It is estimated that a cubic foot of certain varieties of bituminous coal yields: 7 cu.ft. of gas (occluded); 350 cu.ft. of coal gas (on distillation); 54 lb. of coke. The total volatile matter in a cubic foot of coal is estimated to weigh 26 lb.; in this latter estimate, the coal gas is figured at 10 lb. If steam and air are passed over the 54 lb. of coke in a producer-gas retort, the result is to generate 4122 cu.ft. of producer gas. It is further estimated that one ton of coke, 90 per cent. carbon, yields 171,000 cu.ft. of producer gas. Acetylene gas is made by fusing the coke with lime in an electric furnace. By this means calcium carbide (CaC_2) is formed.

There has been considerable discussion concerning the relative merits of salt, as compared with calcium chloride for the treatment of dust on the roadways and chambers of coal mines. Salt of itself has not the power of attracting moisture, but owes what little power it does possess to a small amount of impurity which it contains in the form of magnesium chloride; what little moisture salt does attract is again yielded up at a very few degrees rise in temperature above the normal. On the other hand, calcium chloride retains its moisture at temperatures considerably above 350 deg. F., as this temperature is much exceeded in its manufacture. It holds moisture most tenaciously, even at the above temperature.

Coal is a compound, but a very complicated one; in fact, each variety of coal is really a different compound. Every variety of coal should be regarded as the combination of a number of elements and compounds existing in different proportions, some of them being present always, and some only occasionally. When coal burns, most of the elements combine to form a compound with the oxygen in the air and are given off in gaseous form. Those which do not combine with oxygen, or which form a solid compound, remain behind as ash. In the combustion of coal the oxygen of the air alone enters into combination with it, and so far as is known, the nitrogen of the air has little or no effect on the composition of the products of combustion.

It has already been stated in these notes that calcium chloride (especially when used in the form of a finely ground powder) does not affect the roof of coal mines in such a deleterious manner as does water. It may be further stated in this connection that the action of calcium-chloride liquor upon iron and steel is not one-third so vigorous as the rusting action of plain water. Henry Hall, of England, who is an authority on this subject, recently stated that iron exposed alternately to dampness and air rusts far more quickly than iron exposed to calcium-chloride liquor and air alternately. He says: "This is confirmed by the fact that the bogie rails in the calcium-chloride manufactory, where they are saturated with the article, are as good as new; but in one or two places where water has dropped on them, they are rusting badly and show signs of great wear."

In some mines where an explosion has been largely due to dry coal dust, the investigators have been puzzled because there were no evidences of coked dust on props and on the sides of the entries. Professor Galloway recently stated that this absence of coked-coal dust in certain parts of the workings through which the explosion must necessarily have traveled, was due to the impure nature of the coal dust contained in them; that the dust contained a sufficient proportion of shale-dust to prevent it from forming a coherent coke, or adhering to the timbers and other objects against which it was thrown in a molten condition during the passage of the explosion. In discussing this same problem, Victor Watteyne, inspector general of mines in Belgium, suggested that this absence of coked-coal dust was due to the much higher velocity of the explosion in those parts of the workings, rather than to the impurity of the dust.

In drawing conclusions as to the cause and action of coal mine explosions, the average investigator in this country often ignores well known principles that have been proved beyond doubt. Two European authorities on coal-mine explosions, after carrying on examinations at several collieries where disastrous explosions had occurred, gave the following closely-reasoned analysis of the phenomena observed:

1. In several instances it was found that there was an entire absence of any evidence of the presence of firedamp immediately prior to the occurrence.

2. That the parts of the mine, such as main intake, where it is hardly possible for gas to lodge, are often the scene of the greatest destruction.

3. That the blast sweeps along in a particular direction and leaves other roadways unaffected, whereas the sudden explosion of an accumulation of firedamp and air might be expected to follow the line of least resistance.

4. That the last working-places of a district, and the returns, which, as is well known, are liable to be contaminated with firedamp, hardly ever appear to have played any part in the explosion.

5. That at or near the point of initiation of an explosion, violent effects are seldom found, and everything suggests a gradual increase of force, fed by some agent as the blast travels along and rapidly develops a tornado rushing to the extreme limits of the workings.

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Illustrated.

The Consumption of Lead in 1908

The matter of estimating the consumption of lead in the United States in 1908 is one that we approach with some diffidence owing to the absence of complete, or even fairly complete, data as to the stock in first hands at the beginning and end of the year. In this respect the lead industry is highly deficient as compared with copper and spelter. The reason is obvious. The marketing of lead is so largely in the hands of a single company that it is disinclined to communicate information as to its accumulation of metal even at a late date.

We estimated the stock on Dec. 31, 1907, at 50,000 tons, on the basis of partial reports and some other information. Adding stock, production of refined lead, and imports of refined, and deducting stock and exports, the deliveries in 1907 were computed at 330,738 tons, and the latter figure was taken to be also the consumption. We had reports from domestic manufacturers accounting for 294,029 tons. The same manufacturers in 1908 reported 257,759 tons, indicating a consumption of 87½ per cent. of the amount in 1907. If, then, the total consumption in 1907 was 330,738 tons, the total in 1908 was probably about 290,000 tons. This would imply a total accumulation of about 94,000 tons.

The refiners probably had no such stock as 94,000 tons, sold and unsold, in their hands at the end of 1908. However, their aggregate accumulation was clearly larger than what has been commonly believed, and we are inclined to estimate it at 75,000 tons, leaving about 20,000 tons to be accounted for in second hands, including manufacturers, some of whom are known to have been in an overbought condition during the year. The statistical position of lead was consequently analogous to that of spelter, which we have previously described. We have summarized the data in the following tables:

DELIVERY OF LEAD.
(IN TONS OF 2000 LB.)

	1907.	1908.
Production desilverized	289,399	269,642
Production Missouri lead	127,133	131,117
Production antimonial lead	9,614	13,109
Imports of refined lead	9,277	2,759
Stock, domestic, Jan. 1	4,000	50,000
Foreign in bond, Jan. 1	5,691	12,897
Total supply	445,114	479,524
Re-exports of foreign lead	51,424	76,328
Exports of domestic lead	55	nil
Stock, domestic, Dec. 31	50,000	75,000
Foreign in bond, Dec. 31	12,897	18,462
	114,376	169,790
Delivery	330,738	309,734

CONSUMPTION OF LEAD.
(IN TONS OF 2000 LB.)

Purpose.	1907.	1908.
White lead and oxides	115,000	117,500
Pipe	41,000	33,800
Sheet	21,500	16,400
Shot	28,000	31,600
Other purposes	125,238	90,700
Totals	330,738	290,000

PERCENTAGES OF CONSUMPTION.

	1917.	1908.
White lead and oxides	34.8%	40.5%
Pipe	12.4	11.6
Sheet	6.5	5.7
Shot	8.5	10.9
Other purposes	37.9	31.3
Totals	100.0	100.0

The above figures are deficient through their omission to take into account the production of lead from scrap and junk. In 1907, according to the U. S. Geological Survey, this amounted to 9990 tons. In 1908, according to our figures, the amount was 14,323 tons. Probably there was no actual increase, the larger figure for 1908 being attributable to a more complete statistical enumeration. The actual consumption was by so much greater in each year.

Terminating the Life of a Company with the Mine

It is a common practice among English mining companies—though not as usual in this country—to accumulate a surplus, as the mine approaches exhaustion, for the purpose of purchasing a new property. Sometimes the property acquired is situated in the vicinity or in the same district as the mine which is at the end of its life, but several instances could be given of companies that have gone further afield and have embarked in new mining ventures in other parts of the world. When the new property is situated in the same district, there is a good deal to be said for the adoption of this policy. The experience and knowledge that have been acquired should go far to make the selection of new ground a wise one, and there is the advantage of having an organized staff for the new undertaking, fully acquainted with the local conditions.

When, however, a mining company looks for a new mine outside its own district, it is not so easy to defend this policy. Those who invest their money in a mine do so in the expectation that the mine will be worked to the best advantage and that the profits will be distributed to them and not risked in new ventures. It may be assumed that in buy-

ing shares in any mine for investment they have done so because they believe in that particular property, or in that district, or perhaps in the mineral that is being won. If they had known that their investment were to be changed at the will of the directors and that the profits earned were not to be fully distributed, but were to be re-invested in some other mine of which they had no knowledge and in which they take no special interest, it is probable that they would not have invested at all. This, of course applies to persons who buy a stock for investment, not to those who buy because they hope to sell at an advance, and who look at the stock exchange, not the mine.

The powers of directors are, of course, regulated by the articles of association and shareholders could, if they wished, prevent their directors from speculating in this way. But, as a rule, the average shareholder knows nothing about the articles of association, which are usually drawn up in such a way as to give the directors power to acquire fresh interests without consulting the shareholders. If the sanction of the majority of the shareholders is obtained at a general meeting, nothing more can be said, but without that sanction it does not seem justifiable for directors, although protected by articles of association, to take upon themselves the responsibility of withholding the profits of the shareholders and investing them in some new undertaking. The adoption of this policy is also open to the objection that the directors and other officials are interested in the continuation of the company and, therefore, cannot help being biassed in favor of the acquisition of new ground.

A recent instance of a company that is embarking in fresh fields is the Oroya-Brownhill of Western Australia. According to the report for the year 1908, the mines of this company are approaching exhaustion. Every effort appears to have been made to acquire extensions in the vicinity of the present mines and it is hoped in this way to continue profitable operations for some years to come. But to safeguard the existence of the company, the policy of acquiring a new mine, in whatever quarter of the globe it might be found, has been adopted. After examining a number of mines in different parts of the world the directors have acquired La Leonesa mine in Nicaragua, as well as an option on the Babilonia mine in La Libertad district in the same country. Both of these properties have been favorably reported on by C. S. Herzig. In this case it is important to point out—having regard to what has been said above—that the policy of going into fresh fields was explained to the shareholders at the annual general meeting held a year ago and met with formal acceptance. Against their particular action, of course, nothing is to be said.

From the information given by the chairman at the general meeting, held in London recently, it appears that it is no easy matter to find a promising property at a reasonable price. The directors have perused and considered the reports on 60 properties in the Malay States, on 65 in Western Australia, on 22 in Burma and on 125 in other countries. H. C. Hoover, one of the directors, also gave some interesting information as to the difficulty of finding a good mine; which, however, was not due to any scarcity of mines for sale in London. No less than 680 mining properties were offered; of these about 400 were turned down at once, 150 were rejected after some negotiation, 130 were looked into on the ground to some extent, 20 had been exhaustively examined, one had been purchased and three taken under working options. Such statistics as these are creditable to the managers of the company, since they show that care has been exercised in selecting a property. They also indicate the risk that a company runs, which is not advised by cautious and competent engineers.

Mining Stocks as Investments

There has been much interest of late over the listing of some of the stock of the Steel Corporation on the Paris Bourse. The purpose of this listing is, of course, to effect a distribution of this security among French investors, whose accumulations are very attractive to financiers. We are not going to take up the special matter of the listing of steel, but refer to it in order to point out the favorable attitude of French investors, whose caution is well known, toward mining and industrial enterprises. The Bourse at Paris differs from the stock exchanges at New York and London by being to a large extent a national affair, over which the minister of finance has much control. The favorite security upon the Bourse for a long time has been a copper-mining company, the Rio Tinto. After this, the interest of French investors is now centering in the stocks of the Rand gold-mining companies, in the distribution of which great houses are engaged.

The prominent position of these mining stocks in Paris is widely different from that of similar securities in the United States, where trading in them is largely relegated to the unregulated "Curb market," and even the best are regarded askance by the banks. Yet there are very few forms of property that are so secure as the shares in mining companies that have 10 to 20 years' supply of ore developed ahead. The purchase of a share in such an ore reserve is more analogous to the purchase of real estate than anything else. It is property that actually exists. Unfortunately the number of mining companies that can make such showing is limited.

The thing that has brought most discredit upon mining investments is the impressible vaporing of the "get-rich-quick" men. How best to curb them has long been the attention of many students. The most practicable plan was suggested by Governor Hughes' commission on speculation, which said: "A large part of the discredit in the public mind attaching to 'Wall Street' is due to frauds perpetrated on the small investor throughout the country in the sale of worthless securities by means of alluring circulars and advertisements in the newspapers. To the success of such swindling enterprises a portion of the press contributes. Papers which honestly try to distinguish between swindling advertisements and others may not in every instance succeed in doing so; but readiness to accept advertisements which are obviously traps for the unwary is evidence of a moral delinquency which should draw out the severest public condemnation. So far as the press in the large cities is concerned, the correction of the evil lies, in some measure, in the hands of the reputable bankers and brokers who, by refusing their advertising patronage to newspapers notoriously guilty in this respect, could compel them to mend their ways and at the same time prevent fraudulent schemes from deriving an appearance of merit by association with reputable names." This is precisely what the JOURNAL has previously urged.

The Ooregum Gold Mine

SPECIAL CORRESPONDENCE

The report of the Ooregum company, operating in the Kolar goldfield in India, for the year 1908 shows a record output of gold, the value being £329,317, derived from 121,886 tons, equal to a value per ton of 5s. The mine has now been a gold producer for 20 years, the total gold won amounting in value to £4,866,656. Judging from the favorable report of the directors recently issued, the mine promises to continue its prosperous career, the outlook for the present year being more encouraging than it has been for some years past.

The main vertical shaft, Bullen's shaft, has been sunk to a vertical depth of 3210 ft. The intersection in this shaft of the principal reef, assaying over 1 oz. gold to the ton at 3141 ft. from surface, is an important feature, as it proves the existence of good ore in this reef 200 ft. below the present bottom level of the mine. The ore reserves, estimated at 154,281 tons, for which no value is given, are none too large for a mine of this size, being equivalent to little more than a year's run of the present mill.

Besides the ore reserves in the mine, there is an asset of 80,000 tons of tailings, slimes and concentrates available for treatment. The working costs of the past year amounted to £165,974, classified as follows:

	£	Per Ton Milled.
Administration	£5,768	$0.240
Mining cost	112,036	4.416
Milling cost	13,462	0.528
Tailings cyanide treatment	8,804	0.336
General	25,904	1.008
Total	£165,974	$6.528

As is customary with the Indian mines under the control of John Taylor & Sons the whole of the capital expenditure for the year is charged against profits. Including amounts for depreciation of buildings and machinery the sum deducted from profits in this way was £53,465. In spite of this large deduction it was possible to pay dividends during the year 1908 at the rate of 32½ per cent. on the preference shares and 22½ per cent. on the ordinary shares; dividends which the shareholders will no doubt consider satisfactory, although the rate has been exceeded in former years.

The mine superintendent's report contains a large amount of detail as regards the underground development, most of which, however, must be of interest and intelligible to few. The report would be improved if the working costs were shown on a tonnage basis and if the ton used were that of 2000 lb., as recommended by the Institution of Mining and Metallurgy, instead of 2240 lb. The change from the long ton to the short ton might make some confusion in the statistics of the mine, but this difficulty might be overcome by having the figures worked out side by side on both standards. The metallurgical department seems a little behind the times, the plant for treating slimes being still in an experimental stage. The sands plant treated 108,869 tons of an average assay of 2 dwt. 19 grains; the recovery was 1 dwt. 21.5 grains or 68.5 per cent.

Although there was only one case of plague during the year the labor supply was interfered with by a mysterious sickness, much resembling cholera, from which there were 44 deaths. The disappearance of plague is attributed to the destruction of rats and mice, of which 17,328 were destroyed on the company's property.

The Distribution of Transvaal Gold

SPECIAL CORRESPONDENCE

In the JOURNAL of May 15 there was a notice of a paper by Dr. T. Kirke Rose, written for the Chemical, Metallurgical and Mining Society of South Africa, in which the distribution of the gold produced on the Rand was discussed. In the April number of that Society's JOURNAL, Dr. Rose publishes some correction in the figures originally given. His figures for the imports of gold bullion into the United Kingdom did not account for the gold contained in imported ore, which for the five years 1903 to 1907 amounted in value to £4,137,334. The gold is extracted and converted into bullion in England, and must be counted as part of the available supplies. The revised figures for the total amount of bullion (apart from coin, old material, imported gold-leaf, imported watch cases, etc.) used in the industrial arts in the United Kingdom in the years 1903-1907 are £8,400,000 or £1,680,000 per annum. Hence about 5.4 per cent. of the Rand gold was used in the industries in these years and 30 per cent. for coinage, instead of 4.2 and 31.3 per cent. as given in the original paper.

Copper in Russia

SPECIAL CORRESPONDENCE

A report from the French Ministry at St. Petersburg, published in the *Moniteur Official du Commerce* in Paris, gives a statement of copper production in Russia. The output by districts for two years past is given below, the Russian measures being reduced to pounds:

	1907.	1908.	Changes.
Ural	16,529,033	18,863,715	I. 2,334,682
Caucasus	11,198,661	10,698,393	D. 500,268
Altai	101,072	190,917	I. 89,845
Siberia	2,388,069	5,408,305	I. 3,020,236
From chemical works, etc.	2,355,438	1,971,472	D. 383,966
Total	32,572,273	37,132,802	I. 4,560,529

Production is lessening considerably in the Ural owing to the temporary closing of the Demidov works and the competition of new producers elsewhere. It has also gone down in the Caucasus, chiefly at the Siemens works, where the output in 1908 was only 3,087,124 lb., against 3,924,321 lb. in 1907. The same may be said of the last group, including copper from works operating by chemical process and of the refineries.

Production in Siberia and the Kirghiz district showed a large increase. The reports of the two principal companies show the following output, in pounds:

	1907.	1908.	Changes.
Yenissei	523,154	1,857,010	I. 1,333,856
Spassky	1,864,915	3,551,295	I. 1,686,380

In 1907 the Yenissei company worked only for six months. In 1908 the company worked the full year, the average production being 214,127 lb. per month. The Spassky company in 1908 averaged 479,296 lb. per month, or 262,914 lb. more than in the previous year.

In the Altai work was carried on for seven months in 1907, but for only two months in 1908. Nevertheless there was an increase last year. It may be noted that these mines are only in the development stage, and that a great growth in production may be expected.

The consumption of copper in Russia is estimated as follows, for two years past, in pounds:

	1907.	1908.	Changes.
Production	32,572,273	37,132,802	I. 4,560,529
Imports	10,829,100	10,865,197	I. 36,097
Total supply	43,401,373	47,997,999	I. 4,596,626
Exports	3,934,573	252,679	D. 3,681,894
Consumption	39,466,800	47,745,320	I. 8,278,520

The production in 1908 showed a gain of 14 per cent. The gain in the approximate consumption was 21 per cent., the exports having fallen to a very low figure.

A Transaction in Radium

According to the New York *Sun*, the largest order for radium ever given has just been placed jointly by Lord Iveagh and Sir Ernest Cassel, who will donate it to the Radium Institute for the foundation of which they have provided the funds. The quantity ordered is 7⅛ grams —about ¼ oz. avoirdupois—and the price is $150,000. The largest amount previously bought at one time was 1 gram. The order was given to the British Metalliferous Mines Company, which will obtain it from the Cornish pitchblende deposits under the superintendence of Prof. Giesel, the company's chief chemist.

Metallic chromium is now a commercial article (*Brass World*, May, 1909) and can readily be obtained of high purity and at a reasonable price. As far as known, it has not yet become a constituent of the non-ferrous alloys, although it has long been used in making very hard and tough steels.

The Kilker Matte Tapping Car

By F. T. Havard*

The Kilker matte-tapping car is an example of one of those simple machines which affect such an appreciable saving in the working costs of a smelting plant, that we must wonder at the tardy development and application of the idea in what we are pleased to call the rapid progress of modern metallurgical enterprise.

It has long been recognized that the method, adopted by most of our lead smelteries, of tapping matte from the receiver or forehearth into the small matte pots of 300 or 400 lb. capacity, and subsequently breaking and transporting the matte cones to the railroad cars or hoists, was costly, clumsy and inefficient. But the most unpleasant feature lay in the periodic "runaways" of matte from the receiver, which accompanied the use of the small pots, particularly if the matte fall was at all considerable, that is, above 23 or 24 per cent. of the charge.

It was on account of the vexatious delays in stopping the furnace and the disagreeable work of cleaning up the floor plates, which invariably resulted when the tapper failed to plug the matte hole, that a foreman in the American Smelting and Refining Company plant at East Helena, Mont., sought a safe and efficient method of coping with the task of tapping and transporting the matte. Mr. Kilker conceived the idea of using a horizontal wheel as a carrier for a number of pans which should revolve and cast the matte in thin layers, one to every revolution, so that on the subsequent dumping of the pans, the matte should fall to pieces of a suitable size for the sampling mill or the furnace.

This original idea has developed under the auspices of the able master mechanic and the smelting staff at East Helena into the type of the machines now used at Selby, East Helena and elsewhere, which combine strength and simplicity with thorough efficiency. In fact, Kilker's car embraces all the essentials required to insure its adoption as a standard vehicle for the tapping, molding and transport of matte in all the silver-lead and in many of the copper smelteries of the world.

One safeguard, however, is necessary in working with the car: the lead in the receiver must be kept below the level of the matte tap. Should it be allowed to run with the matte into the car, it will splash and be lost or burn the operators.

Construction of the Car

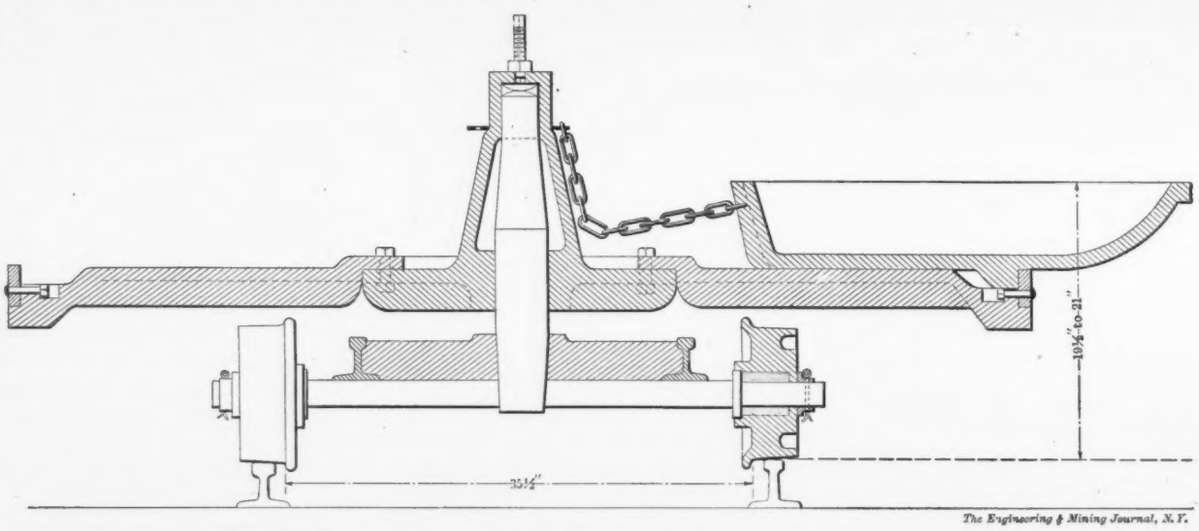
In tapping matte into the Kilker car, it is usual to place the car in position on the rails on the short side of the receiver. A curved spout leads from the matte hole to the car. Instead of a curved spout alone such as the illustration shows, a small brick-lined cast-iron box on wheels may be placed directly in front of the matte hole, and from this box a curved spout leads the matte to the car. The use of this curved spout enables the matte tapper to work with his bar or plug directly in front of the receiver without the danger of being burnt by the hot matte.

The car is known as the "merry-go-round," and the receiving box as the "baby carriage." The wrought-iron frame of the "merry-go-round" is made of I-beams and mounted on roller-bearing cast-iron wheels. On the framework is an upright steel pin, on which revolves the spider that carries the pans. In the more recent machines the spider is a solid steel piece and 16 pans, every one an equal segment of the circle, sit in position on the spider. These pans are cast with a lug on the bottom in such a position that they are prevented from slipping on the car and from falling when the pans are dumped in the manner shown in the accompanying picture. In fact, the nice balance of the pans on the spider is the key to the successful manufacture and operation of the "merry-go-round." A wrought-iron yoke revolves around the pin and the top of the pan strikes against this when being dumped. The pan is held in position at an angle of about 60 deg., with the lug resting on the outside rim of the spider.

Tapping Operations

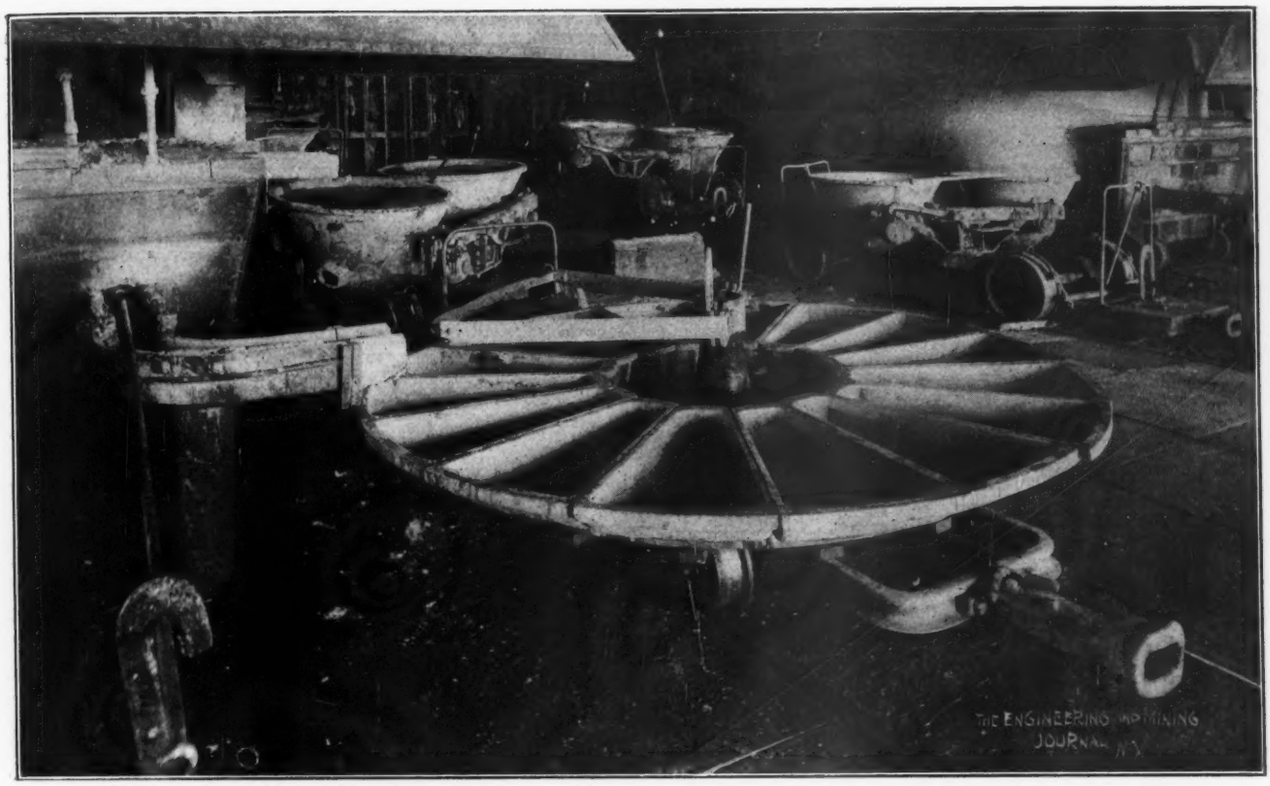
The 16 pans hold between 3000 and 3300 lb. In East Helena two are in use at each furnace. The method of procedure is as follows: When the car is placed beside the receiver it is slowly set revolving and kept in motion during the tapping until the furnace man plugs the hole. It is at once hauled out toward the dump about 50 yd. by an electric locomotive, and uncoupled; it then runs by gravity to the track above the box cars. An empty "merry-go-round" from the previous tap stands on a side track ready to be hauled beside the receiver. After standing 30 minutes the matte contents are dumped into the box car by raising the small end of the pans; three pans are tilted at a time against the wrought-iron stay bar and then knocked back into position. The "merry-go-round" and the stay bar are then revolved in opposite directions and three more pans are dumped until the matte is all unloaded. The whole operation takes only a few minutes. The pans are then "washed" with adobe clay and the car is ready for the next tap.

In one of the appended sketches no stay yoke is seen, but in its stead is shown a chain which was formerly used to keep the pans from swinging too far when being dumped. The life of the pans is good, particularly if care is taken to warm them all over before tapping into them. It is estimated that the use of the car has reduced the cost of working the matte by about 15c. per ton. This represents a very considerable saving of money in a plant smelting 400 or 500 tons of ore per day and producing about 100 tons of matte.



SECTIONAL ELEVATION OF KILKER CAR—CHAIN REPLACED BY YOKE IN LATER MODELS

*Mining engineer, Helena, Mont.



THE KILKER MATTE-TAPPING CAR DEVELOPED AT EAST HELENA, MONT.

DUMPING MATTE FROM THE KILKER MOLDS DIRECT TO RAILROAD CARS—HAND SLEDGING ELIMINATED

Practical Test of a Tunnel Boring Machine

The Machine Chips away Entire Face of Tunnel with Chisel Bit Drills; Advanced 3 1-2 Inches in 10 Minutes During Recent Test

BY JOHN TYSSOWSKI

Many efforts have been made to solve the problem of designing a machine to rapidly cut tunnel headings. Since 1853 over 30 machines have been tried and proved failures, in every case some practical consideration or vital principle in construction having been overlooked. Recently the Karns, Sigafoos, Proctor, and Granger designs have attracted attention. The Terry, Tench & Proctor tunneling machine, the joint production of O. S. Proctor, of Denver, and E. F. Terry, of the Terry & Tench Company, contractors, New York, is now receiving a practical test in excavating a drain tunnel for the New York Central excavation near Forty-sixth street, New York. At a trial run made June 3, 1909, this machine succeeded in advancing an 8-ft. heading 3½ in. in 10 min., chipping away the entire face of the rock, a fairly tough and compact mica schist. The machine was operated under 80-lb. air pressure, whereas the designers claim it should have 100 lb. of air. The tunneler ran without any hitch, and was stopped only when a stringer of quartz was encountered on the outer rim of the heading and was found to hold the machine back. Two more drills or groups of hammers will be added to cover the outer portion of the circle excavated, thus doubling the number on the outer circumference of the circle; this will allow the entire face to advance at a more uniform speed.[1]

Description of Tunneler

Fig. 2 shows the machine in position at the start of the tunnel in the New York Central excavation. Fig. 1, reproduced from *Engineering News*, Nov. 19, 1908, shows diagrammatically the construction of the tunneler. It weighs 15 tons, is about 25 ft. long over all, and cuts a tunnel 8 ft. in diameter. At the rear, the mechanism is carried on a four-wheel truck running on a 22-in. track of light T-rails; the front end is carried on two conical wheels that fit the surface of the excavation. A 20-in. I-beam laid flatwise forms the frame of the machine. The forward end of the beam rests on the front truck while the rear end bears a yoke casting carried adjustably on the rear truck. The tunneler is fed forward and kept up to its work by a double (staggered) spur gear, journaled on the truck, which engages a line of duplex rack-rails laid midway between the rails upon which the machine is carried. The feed is operated by means of a compressed-air engine and worm gearings on the truck, the reduction being 5000 to 1, the length of feed 14 ft., and the maximum speed at which the machine can be moved 8 in. per min. At the rear end of the main hollow shaft are adjusting screws by means of which the yoke bearing the rear end of the frame is moved, thus regulating the horizontal and vertical directions of advance. The head of the machine is rotated by another compressed-air engine and train of gearing. During the trial run, the head made one revolution every 1¾ min., the drills traveling at speeds ranging down from a maximum of 0.25 ft. per sec.

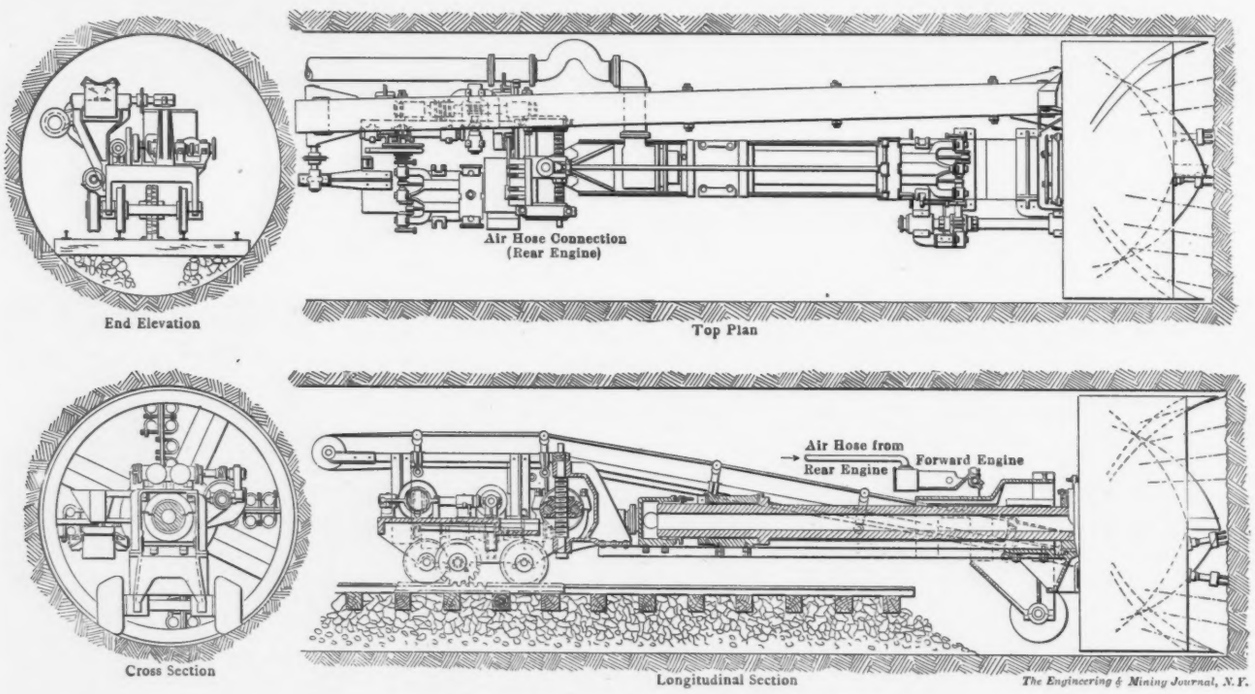


FIG. 1. DIAGRAMMATIC REPRESENTATION OF MACHINE

From the hub of the main head radiate four arms which connect to the outer castings of the head and four bars that carry the pneumatic drills. Air is conveyed to the drills from the central bore of the main hollow shaft, by air-hoses connected to valved branches on the forward end of the shaft.

The hammers are arranged so as to chip away the entire face of the entry. At present there are 25 of these drills each carrying four chisel bits on the machine, but as stated above, two more will be added in order to insure the outer periphery of the circular heading being cut as rapidly as other portions. The drills

[1]Since this article was written it has been found necessary to remove the machine in order to make the necessary changes.

FIG. 2. THE TUNNELER IN POSITION FOR TRIAL IN NEW YORK CENTRAL EXCAVATION

have spool valves, and are air cushioned at either end of the cylinder, a very important consideration in work of this class where portions of the headings may be of soft material while others are hard rock. Fig. 3 shows in a general way the form of air tool used on the tunneler. The chuck has been slightly modified, however, and the air cushions are merely indicated as occupying the spaces formerly used for springs.

Handling the Debris

Steel plates placed between the hammers form pockets into which the chippings are caught; these pockets discharge into a hopper at the rear of the rotating head. The débris is carried to the rear of the machine by a conveyer belt driven by the forward air-engine. Four rails will be laid behind the machine, the central two being spaced 22 in. so as to carry the rear truck of the machine while the outer two, spaced at 18 in. gage, form tracks for muck cars. Switching facilities will have to be provided. A waterspray

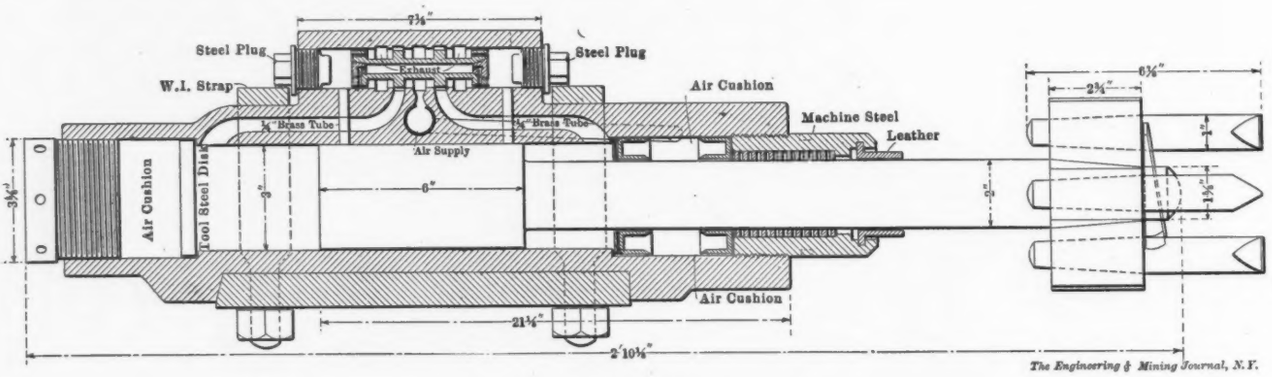


FIG. 3. GENERAL FORM OF THE AIR DRILLS

plays on the face of the heading, thus keeping down the dust.

In the test one engineer and three helpers were employed but when the device for handling the chippings is perfected the designers claim that only one helper will be required. Providing that the machine operates 20 hours out of the 24 and maintains the speed attained in the recent test, it would make an advance of 35 ft. per day. However, it must be borne in mind that this machine must cut away over 100 times as much as is ordinarily cut by drills in driving a tunnel, and that the opportunities for breakage and disablements of the machine are multiplied many times. Only a practical working test covering a long period of time (such as is now being started) will serve to demonstrate the future usefulness of this machine. The great advantages to be derived from the successful operation of such a tunneler would be in the rapid rate of advance attained, at a probable lower cost than is now possible, and the desirable form of tunnel cut. With the circular cut, in a natural arch, comparatively little timbering would be required in good ground.

The designers claim an air consumption of 3000 cu.ft. per min., and estimate that the machine can be operated at a cost of $300 per day. They also hope to excavate from 1256 to 3768 cu.ft. of rock per day, which means an advance of from 25 to 75 feet.

Power Development in Colorado

A great work, and a still greater boon to the miners of the State, is that of the Central Colorado Power Company, which has been quietly spending millions in controlling and developing the power contained in the streams of the State and delivering it to the mines, thus lowering the costs of mining and milling, and increasing the production by enabling an immense tonnage of low-grade ores to be marketed at a profit, which otherwise would not pay to extract or treat. This will be more readily realized when it is stated that the above company is supplying power at $75 per h.p. per annum which would cost the mines from $100 to $150 to make by steam. An additional advantage, as proved by the past severe winter, lies in the fact that a great many of the mines were idle through inability to get their supplies of coal to the mines, whereas those which obtained their power from the electric power company worked along steadily.

The benefits which will accrue to other industries are enormous, but these being outside the province of the JOURNAL, need not be here enumerated. In the category of benefits conferred on the mining industry, however, must be included the supplying to Denver—the great mart of supplies and machinery—of part of the power for the Denver Gas and Electric Company, a contract for which was signed last December involving a sum of $200,000 yearly. It is expected that the Central Colorado Power Company will begin supplying this power in a few days.

The hydroelectric generating plant at Shoshone, near Glenwood Springs, on the Grand river, has been so far completed that 4000 h.p. are being transmitted to Leadville and Summit county mines, mills and dredges, and several thousand horsepower are also sent to the Boulder county mines. At this plant, the water is conveyed from the intake at the diverting dam through a tunnel 11x16 ft. in the clear, and 12,700 ft. in length, the bottom and sides being lined with concrete. It has a capacity of 1250 cu.ft. per sec. and gives a head of 165 ft. The power house is equipped with two 9000-h.p. turbines, each direct connected to a 5000-k.w., three-phase, 60-cycle, alternating current generator, giving a total of 18,000 h.p. It is the purpose of the company to extend the tunnel later on, and the ultimate resulting capacity will be from 30,000 to 40,000 horsepower.

On Middle Boulder creek, about thirty miles northwest of Denver, another plant is under construction. This consists of a reservoir with a capacity of 500,000,000 cu.ft., the water to be conducted 12 miles through a concrete pipe 36 in. in diameter, to a terminal reservoir, from which the water will be sent to the power plant through a steel pressure pipe 9500 ft. long, the resulting head being about 1850 ft. The power house will contain two impulse waterwheels, with a total capacity of 21,000 h.p., each of which wheels will be connected to a generator of about 10,000 h.p. This plant is expected to be completed this year.

Still another development is at Gore cañon, on the Moffat road, about 120 miles west of Denver. This will have a diverting dam on Grand river, a tunnel 5 miles in length, giving a head of 350 ft., and a capacity of from 20,000 to 30,000 h.p. The Leadville, Boulder, Breckenridge, Georgetown, Idaho Springs, Dillon and other mining camps in the northwestern portion of the State will be supplied from the above plants. At the beginning, the management of this great enterprise left much to be desired, but its ultimate successful construction is due to the skill and efforts of Frederick A. Abbott, chief engineer, and G. H. Walridge, general manager, both of New York.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COAL AND COKE

COKE—Means for Supplying Air to Coke-Ovens. John H. Hillman, Pittsburg, Penn. (U. S. No. 924,462; June 8, 1909.)

COKE-DRAWER. Harvey Cory, Pittsburg, Penn. (U. S. No. 923,410; June 1, 1909.)

COKE—Process of Obtaining Ammonia and Tar. Heinrich Koppers, Essen-on-the-Ruhr, Germany. (U. S. No. 12,971; June 8, 1909.)

COKE-DRAWING APPARATUS. Charles M. Clarke, Pittsburg, Penn., assignor to Hebb Coke Drawer Company, Uniontown, Penn., a Corporation of Pennsylvania. (U. S. Nos. 923,139 and 923,140; June 1, 1909.)

COKE-OVEN. George W. Thompson, Collinsville, Ill. (U. S. No. 924,293; June 8, 1909.)

MINING-MACHINE—Electric Coal-Puncher or Mining-Machine. John H. Thompson, Charleston, W. Va., assignor to Johnson Electric Machine Company, Charleston, W. Va., a Corporation of West Virginia. (U. S. No. 922,736; May 25, 1909.)

PEAT—Improvements in Elevators Applicable to Apparatus for the Production of Peat Fuel. Andrew Kesson, Lynedock, Scotland. (Brit. No. 23,392 of 1907.)

COPPER

PURE COPPER—Process for Obtaining Pure Metallic Copper from a Solution of a Salt of Copper. Lucien Jumau, Paris, France. (U. S. No. 924,077; June 8, 1909.)

PURE COPPER—Process for Obtaining Pure Copper. Lucien Jumau, Paris, France. (U. S. No. 924,076; June 8, 1909.)

GOLD AND SILVER

ALLUVIAL MINING—Method of Recovering Values from Alluvial Deposits. Ole T. Crosby, Nome, Alaska. (U. S. No. 923,116; May 25, 1909.)

FILTER-PRESS. Samuel K. Behrend, Denver, Colo. (U. S. No. 924,131; June 8, 1909.)

PAN-RIFFLE. John M. White, Selma, Ore. (U. S. No. 923,392; June 1, 1909.)

PULP-AGITATOR William C. Paterson, Denver, Colo., assignor, by direct and mesne assignments, to the Rapid Cyanide Extraction Company, a Corporation of Colorado. (U. S. No. 923,571; June 1, 1909.)

IRON AND STEEL

ELECTRIC FURNACES—Improvements in or Relating to Electric Furnaces for the Manufacture of Steel. Adolphe Hugot, Firminy, France. (Brit. No. 12,258 of 1908.)

ELECTRIC TEMPERING-FURNACE. Vernon Royle, Paterson, N. J. (U. S. No. 924,109; June 8, 1909.)

MANUFACTURE—Method of Consolidating Flue-Dust for Use in the Manufacture of Steel. William Thomlinson, Seaton Carew, West Hartlepool, England. (U. S. No. 923,605; June 1, 1909.)

SLAG—Machinery for Conveying Blast-Furnace Slag. Edward A. Uehling, Passaic, N. J. (U. S. No. 923,218; June 1, 1909.)

TREATMENT OF STEEL—Process for the Treatment of Steel for Industrial Purposes. La Société Schneider & Cie, La Creusot, France. (Brit. No. 24,244 of 1908.)

NICKEL

ORE TREATMENT—Process of Treating Nickel Ores. Anson G. Betts, Troy, N. Y. (U. S. No. 923,005; May 25, 1909.)

MINING—GENERAL

BORE HOLES—Improvements in or Relating to Waterproof Lining for Bore Holes. Maurice Bodart and the Deutsche Solvay-Werke Aktiengesellschaft, Prussia, Germany. (Brit. No. 21,197 of 1908.)

FIRE EXTINGUISHING—Method of Extinguishing Fires in Mines. Frank T. Byers, Mount Pleasant, Penn. (U. S. No. 924,599; June 8, 1909.)

SHAFT SINKING—Sinking Shafts and the Like. Daniel E. Moran, Mendham, N. J. (U. S. No. 923,984; June 8, 1909.)

VENTILATION—Gas-Extractor and Mine-Ventilator. George Laws, Philipsburg, Penn. (U. S. No. 922,603; May 25, 1909.)

ORE DRESSING—GENERAL.

CLASSIFIERS—Improvements in, or Relating to Classifiers or Separators for Minerals of Different Specific Gravities. Creighton Churchill, Brookline, Mass. (Brit. No. 7841 of 1908.)

CONCENTRATION—Method for Concentrating Ores. Albert H. Stebbins, Little Rock, Ark. (U. S. No. 923,455; June 1, 1909.)

CONCENTRATORS—Improvements in Ore Concentrators. Communicated from Charles W. Eccleston, Los Angeles, Cal. (Brit. No. 19,163 of 1908.)

CRUSHING-ROLLS. Arthur E. Hogue, Toronto, Ontario, Canada. (U. S. No. 924,352; June 8, 1909.)

ELECTROSTATIC SEPARATING PROCESS. Lucien I. Blake, Lawrence, and Lawrence N. Morscher, Neodesha, Kan., assignors to Blake Mining and Milling Company, Denver, Colo., a Corporation of Maine. (U. S. No. 924,032; June 8, 1909.)

ORE-PULVERIZER. George P. Good, Detroit, and William L. McCullough, Ypsilanti, Mich., assignors to the W. L. McCullough Company, Ypsilanti, Mich., a Corporation of Michigan. (U. S. No. 922,577; May 25, 1909.)

ORE-JIGGER. William M. Williams, Gridley, Cal., assignor of one-half to J. L. Mints, Gridley, Cal. (U. S. No. 923,917; June 8, 1909.)

ORE-SEPARATOR. Charles M. Mullen, Baker City, Ore. (U. S. No. 923,988; June 8, 1909.)

ORE-SEPARATOR. Elmer A. Ross, Ticonderoga, N. Y., assignor of one-fourth to Dorus C. Bascune, Ticonderoga, N. Y. (U. S. No. 919,246; April 20, 1909.)

WATER-JIG. Gelasio Caetani, Kellogg, Idaho. (U. S. No. 923,328; June 1, 1909.)

METALLURGY—GENERAL

BRIQUETTING—Improvements in the Process of Briquetting Ore with Blast-Furnace Slag. Wilhelm Lessing, Troisdorf, Germany. (Brit. No. 18,680 of 1908.)

PHYSICAL PROPERTIES—Improvements in and Relating to Processes for Improving the Physical Properties of Metals and Their Alloys. David Lamon and Theodore H. Thomas, Denver, Colo. (Brit. No. 12,452 of 1908.)

PRECIPITATION—Method of Thionous Precipitation of Copper or Silver from Their Solutions. (U. S. No. 923,916; June 8, 1909.)

REFRACTORY ORE TREATMENT—Method of Reducing Ores. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, New York, N. Y., a Corporation of West Virginia. (U. S. No. 924,130; June 8, 1909.)

MINING MACHINERY AND APPARATUS

AIR-COMPRESSOR. Electric Air-Compressor. Augustine J. Pocock and Richard E. Allgire, Dayton, Ohio, assignors to the Platt Iron Works Company, Dayton, Ohio, a Corporation of Ohio. (U. S. No. 918,149; April 13, 1909.)

CONVEYING MACHINERY—Improvements Relating to Conveyer Apparatus, More Particularly for Conveying Ore and Stuff from Shallow Lodes. Paul Töniges, Berlin. (Brit. No. 25,640 of 1908.)

DRILL. Martin Hardsocg, Ottumwa, Iowa. (U. S. No. 923,513 and 923,514; June 1, 1909.)

HEWING APPARATUS for Open-Air Mining. Emil Wischow, Luebeck, Germany. (U. S. No. 919,105; April 20, 1909.)

MINE CAGES—An Improvement Applicable to Pit Cages and Hoists. James Harrison, Clayton; Richard Oliver, Beswick, and Edward Peters, Manchester, Eng. (Brit. No. 1395 of 1909.)

MINE-CAR BRAKE. Isaac Glen, Trafford City, Penn. (U. S. No. 923,260; June 1, 1909.)

MINER'S CANDLESTICK. Charles J. Ramstead and Peter J. Johnson, Ouray, Colo. (U. S. No. 922,950; May 25, 1909.)

MINERS' LAMPS—Reflector for Miners' Lamps. Zachariah Hough and Leslie F. Weaver, Banning, Penn. (U. S. No. 923,655; June 1, 1909.)

MINERS' LAMPS—A Stand for Miners' Lamps. John Hardy, West Hartlepool, Eng. (Brit. No. 17,766 of 1908.)

MINING TOOL—Combined Mining and Track Tool. William L. Groom, Coal Valley, Ala. (Brit. No. 23,391 of 1908.)

ROCK DRILLS—Improvements Relating to Rock Drills. George H. Rayner, Nether Edge, Eng. (Brit. No. 25,626 of 1908.)

TIMBERING—Reinforced Concrete Mining-Timbers. John A. Elliott, Butte, Mont. (U. S. No. 924,153; June 8, 1909.)

METALLURGICAL MACHINERY AND APPARATUS

ELECTRIC FURNACE. Frédéric M. Chaplet, Laval, and Alexandre Rémond, Paris, France. (U. S. No. 923,018; May 25, 1909.)

ELECTRIC FURNACES—Improvements in Electric Furnaces. Charles E. Knowles, Holmdale, Eng. (Brit. No. 13,502 of 1908.)

ELECTRIC FURNACES—Improvements in Electric Furnaces. Erik Cornelius, Trollhaten, Sweden. (Brit. No. 10,378 of 1908.)

FURNACE for Gasifying Coal. Roasting Ores and the Like. Hans Ries, Munich, Germany. (U. S. No. 922,042; May 18, 1909.)

FURNACE—Revolving Furnace for Volatilizing Ores. Harry H. Hughes, Springfield, Mo. (U. S. No. 922,906; May 25, 1909.)

ORE-TREATING FURNACE. Chauncey C. Medbery, New York, N. Y. (U. S. No. 922,609; May 25, 1909.)

POWDERED FUEL—Improvements in, or Relating to Apparatus for Supplying Fuel in Powdered or Similar Form in Furnaces. Otto Trossin and Mrs. I. E. Robinson, London. (Brit. No. 4256 of 1908.)

PRECIPITATION—Apparatus for Use in Solution and Precipitation Processes. Woldemar Hommel, London, England, assignor to Metals Extraction Corporation, Limited, London, England. (U. S. No. 918,749; April 20, 1909.)

PRECIPITATION—Improvements in, or Relating to Apparatus for Use in Solution and Precipitation Processes. Woldemar Hommel and the Metals Extraction Corporation, Ltd., London. (Brit. No. 24,017 of 1907.)

REVERBERATORY REGENERATIVE Furnace. Thomas S. Blair, Jr., Elmhurst, Ill., assignor to the Blair Port Company, New York, N. Y., a Corporation of New York. (U. S. No. 12,939; reissue; April 13, 1909.)

ROASTING FURNACES—Improvements in, or Relating to Mechanical Roasting Furnaces. Roman von Zelewski, Engis, Belgium. (Brit. No. 15,192 of 1908.)

ROASTING FURNACE—An Improved Rotary Roasting Furnace. John R. Down and Frederick J. Morgan, Swansea, Wales. (Brit. No 12,825 of 1908.)

ROASTING-FURNACE. John E. Greenawalt, Denver, Colo. (U. S. No. 919,000; April 20, 1909.)

ROASTING-FURNACE. Frank E. Marcy, Salt Lake City, Utah, assignor to Frank Klepetko, New York, N. Y. (U. S. No. 920,971; May 11, 1909.)

ROTARY ORE-EXTRACTOR. Jesse O. Blackburn, Chloride, Ariz. (U. S. No. 923,319; June 1, 1909.)

SMELTER SMOKE—Apparatus for Condensing and Purifying Smoke, etc. Selden I Clawson, Salt Lake City, Utah. (U. S. No. 922,260; May 18, 1909.)

SMOKE PREVENTION—Improvements in Smoke Consuming Devices for Furnaces. Imanuel Bausch, Karlsruhe, Germany. (Brit. No. 18,859 of 1908.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

A. F. Kuehne is in New Mexico on professional business.

Frederick H. Morley, of Denver, Colo., is visiting New York.

Charles G. Yale, of San Francisco, is in New York on a visit.

Arthur James, of New York, has been visiting Morenci, Arizona.

W. G. Trethewey, of Toronto, is inspecting mining properties in the Sturgeon lake area.

Prof. William P. Blake has been reappointed territorial geologist of Arizona for another term.

President J. H. Plummer, of the Dominion Iron and Steel Company, has sailed for England.

F. F. Sharpless is at Placerville, Cal. He will go thence to Nevada before returning to the East.

Pope Yeatman has gone to Alaska and will not return to New York until the middle of September.

O. H. Fairchild, of Denver, has gone to Arizona to examine mining claims near Hot Springs Junction.

Kirby Thomas, of Mexico City, is examining a quicksilver property in the southern part of Mexico.

Robert Schorr has removed his office to the Postal Telegraph building, Market and Battery streets, San Francisco.

H. F. Fay, president of the Allouez and the Centennial copper companies of Michigan, is a visitor at these properties.

Robert H. Richards, of Boston, is devoting two or three weeks to professional work in and about Denver, Colorado.

J. A. Skeene has been appointed superintendent of the Pan Silver mine at Cobalt, Ont., in place of M. McCallum, resigned.

J. Morgan Clements, of New York, has gone to New Mexico on professional business. He expects to be absent about three weeks.

James W. Myers has returned to Golden, Colo., after a year and half visit to New Zealand, in the interests of a large mining company.

B. Leyson has resigned as manager of the City of Cobalt Mining Company at Cobalt, Ont., and will develop some claims in the Montreal river country.

Dr. Henry M. Ami retires at the end of June from the Geological Survey of Canada after a continuous service of 28 years, on account of failing health.

Herbert S. Crocker and Milo S. Ketchum have formed a partnership under the title of Crocker & Ketchum, as consulting engineers, with offices at 811 Seventeenth street, Denver, Colorado.

C. B. Ireland, of Georgetown, Colo., has been appointed general manager and superintendent of the Atlantic Mining and Milling Company, operating in the Atlantic district in Clear Creek county, Colorado.

Morton Webber has been engaged as consulting engineer for the firm of Weir Brothers & Co., New York, for a period of two years. He has had experience in several countries in the examination of mines.

Arthur K. Adams, for the past two years professor of geology at the New Mexico School of Mines, Socorro, N. M., is now a mineral inspector for the General Land Office, with headquarters at Huron, South Dakota.

Hon. William Templeman, head of the Mines Department of Canada, has gone to the Pacific coast, and during the summer will visit the Yukon, accompanied by R. W. Brock, director of the Canadian Geological Survey.

Selwyn Goldstein, formerly manager and engineer of the Great Boulder Proprietary mine in Western Australia, is in Mexico representing British interests. His address is care Banco de Londres y Mexico, Mexico City.

S. E. Bretherton has returned to his office in San Francisco from a trip of several weeks on business in connection with the Friday-Lowdon Copper Company and the Afterthought Copper Company, of Shasta county, California.

Alfred Campion has been appointed lecturer on iron and steel metallurgy at the Technical College of Glasgow, Scotland, and John S. G. Primrose lecturer on assaying and treatment of the precious metals. They succeed Professor Sexton, who has resigned.

Charles H. Clapp, who during the season of 1908, commenced a geological and topographical survey of the southern portion of Vancouver island, has returned to the island to continue this work, which is under the auspices of the Geological Survey of Canada.

W. J. Sutton, of Victoria, has been authorized by the Geological Survey to report on the rocks of the east coast of Vancouver island. As geologist for the Dunsmuirs, chief owners of large coal mines, Mr. Sutton has already done much geological work on the island.

Obituary

Colonel Charles C. Mattes died at Scranton, Penn., June 8, aged 51 years. He was for a number of years connected with coal interests in the Wyoming valley, and was general manager of the Lackawanna Coal and Iron Company.

Guy C. Barton, at one time president of the Omaha & Grant Smelting Company, died at Omaha, Neb., June 15. He was prominent in the organization of the American Smelting and Refining Company, but held no office in that company.

Captain Johnson Vivian, one of the pioneers of the Lake Superior copper district, died at his home at Houghton, Mich., June 17, at the age of 80 years. Captain Vivian was born in Cornwall, England, in 1829, and spent his early life in the mines in that county. In 1853 he came to the United States and located in Keweenaw county, Mich., where he worked as a miner. His rise was rapid; he had been chief mining captain and agent for several of the mines in the Lake Superior district, among which were the Copper Falls, the Hancock, the Franklin and the Huron.

D. V. A. Williams died in Los Angeles, Cal., May 16, as the result of hardships incurred while lost on the California desert some months ago. He was 56 years old. He was born in New York, but removed to Joliet, Ill., when a young man. In 1879 he went to Leadville, Colo., and engaged in mining. Later he was 16 years in Mexico, where he had charge of the development of several mining claims. After leaving Mexico he went to southern California, making his headquarters at Johannesburg. For some time he had been president and general manager of the Sydney Group Mining Company.

Societies and Technical Schools

Western Association of Technical Chemists and Metallurgists—A dinner will be given July 2 at the Brown Palace hotel, Denver, in honor of Professor and Mrs. Robert H. Richards, of Boston, who will both speak on subjects relating to their work in chemistry and metallurgy.

Engineers' Society of Pennsylvania—At the meeting held in Harrisburg, June 12, it was decided to form a general State society of engineers, to be recognized by the legislature of Pennsylvania with authority to restrict practice to men of competence in their lines. The convention was held under the auspices of the Engineers' Society of Pennsylvania, having headquarters in Harrisburg, and was attended by delegates from the Engineers' Club of Philadelphia, the Engineers' Society of Western Pennsylvania, and the Engineering Society of Northwestern Pennsylvania. Resolutions were adopted providing that each of the societies participating should name a committee of three to form a general committee to meet in Harrisburg prior to October next and organize for the purpose of framing a code to be submitted at a convention to be held in the summer of 1910. Engineers of all branches in the State will be invited to become members.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Denver, Salt Lake City, Goldfield, Colbalt, Mexico

REVIEWS OF IMPORTANT EVENTS

San Francisco

June 18—A company has been formed in San Francisco to furnish electric power for mining districts in Sierra county. A dam has been built two miles above Downieville, which is 21 ft. high and stood the flood waters of last winter. The water rights are mainly on the south fork of the North Yuba river between Downieville and Sierra City these having been taken up by W. A. Lotspeich and Con. York, of Downieville. The site for a power-house on Durgan Flat has been selected. Foreign capital has agreed to take the bonds. A power line from this plant will soon be built to Forest and Alleghany, where such rich development among the mines has lately taken place.

Interest in the gold discoveries in reopened old mines at Alleghany and Forest, Sierra county, still continues. L. P. Woodbury, of the Rainbow has financed his mine in Colorado and is now starting in on a large scale. More rich ore is being taken out than at first. The Red Star ledge, also handled by Mr. Woodbury, will be actively developed. A tunnel is being driven ahead to intersect the Tightner vein. The El Dorado is still turning out jewelry ore, as is the now namous Sixteen-to-One. The old Wm. Irelan claims have been bonded to C. C. Ward and will now be worked after over a quarter of century of idleness. They paid well as far back as 1853 when they were located. At Forest, in the same county, many claims have lately been placed under bond to different parties. Good ore has been found in the Lucky Point and in the Davis & Phippen claim. The Hunch vein, parallelling the Plumbago and Rainbow mines, is to have a tunnel started for the vein. At Perry Bixby's mine below Forest, a 2-ft. vein carrying ore running up into the hundreds per ton has been found.

In Yuba county also there is quite a mining revival. For a long time this county produced millions from its hydraulic mines, but when they were closed down mining languished for years. Then came the dredge men who have developed an extensive industry along the river and one which is increasing in importance yearly. At Brownsville and Browns Valley several promising quartz mines are being operated and some others of the old mines are being reopened. In these places, as well as at Smartsville, Indiana ranch and Camptonville, scores of prospectors have gone to work this summer.

Butte

June 17—The report of the Amalgamated Copper Company for the fiscal year ending April 30, 1909, has recently been published. The report states that electrical power is being used for operating the mine pumps and that experiments are now being made to ascertain the feasibility of operating the hoisting engines by compressed air generated by electricity. The net income is stated to have been $3,633,980, as compared with $6,670,557 for 1908, and $14,154,400 for 1907. The dividends were $3,077,758 as compared with $6,155,516 in 1908, and $11,926,312 in 1907. The surplus was $586,222, as against $525,041 in 1908 and $2,228,088 in 1907. The liabilities are as follows: Capital stock, $153,887,900; accounts payable, $22,565; dividends payable in May, $769,439; surplus and reserve, $12,595,045.

In the suit of the Butte Water Company against the Reins Copper Company, a default judgment against the mining company was recently entered for the sum of $598. The Columbia-Butte Mining Company has begun action against Henry T. Heyder to recover $60,000 damages. In its complaint the company states that in 1908 it paid to defendant $50,000 for the Morning Star, Evening Star, Columbia, Germania and Washington lode claims, which were deeded to it by defendant, but that the defendant never in fact was the owner of the Evening Star and Washington claims and owned only one-fourth of the Columbia. The complaint states that the value of the property for which the defendant was unable to give a title was $30,000 and that, owing to its inability to put through a deal with all of the property it was damaged to a further sum of $30,000.

In the adverse suit of Allen Giberson against the Tuolumne Copper Mining Company, the local district court has decided that the plaintiffs own the quartz claim in dispute. The plaintiff claimed the ground under the Merrimac location and the defendant under the Smoky Moke location. In the case of the Milwaukee Gold Extraction Company against George W. Gordon and C. A. Brooks for the possession of the Big Bill quartz claim located in Granite county, Judge H. L. Meyers, of the local district court, has decided that the claim belongs to the defendants. The latter part of last week the new stack at the Boston & Montana smelter, at Great Falls, was put in use. The stack is 506 ft. in hight and is the largest in operation in the world. It has been in course of construction since the fall of 1907.

Denver

June 19—The Golden Cycle company operating the mine of the same name in the Cripple Creek district and the mill at Colorado City has paid the final instalment for assuming control of the Pike's Peak Fuel and the Central Fuel companies. The former corporation owned the Pike View, Danville and Williamson coal mines, north of Colorado City, comprising 2500 acres and furnishing most of the coal output for the immediate vicinity. The Golden Cycle company also controls about 11,000 acres farther east held in the name of the East Colorado Coal and the East Colorado Springs Land companies and it will now be in a position to proceed with the construction of the projected electric power plant near the Pike View mine. It is stated that $200,000 will be spent in the initial unit and that power will not only be furnished for the Golden Cycle mill but that a franchise will be asked from the city with the purpose of entering the local public lighting and power field. Through its coal companies, the Golden Cycle company will sell coal to the mines in the Cripple Creek district.

The Modern Smelting and Refining Company, which is constructing a copper-smelting plant, two miles beyond Argo, at Utah Junction, will double the capacity of the plant as soon as the first unit is put in operation. The identity of the interests behind this plant has been a matter of some speculation in this vicinity. The plant is being constructed under the direction of Henry C. Reno and the company is incorporated for $2,500,000. The plant will have railroad connections with the Moffatt road, the Colorado & Southern and the Burlington.

Last Spring the Cleveland shaft at Leadville was sunk to a depth of 825 ft. and drifts started north and south from the shaft to cut the vein. The flow of water was so heavy that work was temporarily abandoned and drifts started at the 690-ft. level. After driving about 125 ft., in the Cambrian quartzite, the vein has been opened, showing 4 ft. of mineral, with the hanging-wall not yet exposed. Since the opening of the vein the work of timbering to secure the ground has been in progress; when this is completed the vein will be thoroughly explored. The character of the ore is similar to that found above in

the porphyry, and is of smelting grade. The opening of this fissure in the Cambrian quartzite is the most important event of the season in this camp.

Salt Lake City

June 18—The Daly-West company has posted the second quarterly dividend of 30c. per share and amounting to $54,000. The reports show a surplus of $391,283 at the end of the first quarter. A station is now being cut on the 1700-ft. level, and a crosscut to the vein will soon be under way at that point. It will require about 900 ft. of work to reach the ore. The drift to the drain tunnel should reach the ledge within the next 400 ft., while about 200 ft. will make connections in the shaft. It is expected that this work will be finished in about 90 days.

The litigation in connection with the Daly-West company is creating much interest. The Otto Hanke, John J. Daly, and H. R. McMillan interests have applied to the District Court for an alternative writ of mandate to examine the Daly-West books and the management now charges that this faction is not acting in good faith but for the interests of the Daly-Judge, a rival company, which owns adjoining ground in Park City. The charge is made that Hanke, Daly and McMillan are stockholders in the Daly-Judge, and it is alleged that they are planning to get this information for the purpose of seeking to control the company for the interests of the Daly-Judge company.

The Colorado, Sioux Consolidated and Iron Blossom companies, owning properties in the Tintic district, posted dividends on June 10 aggregating $210,000. The Sioux Consolidated announced a dividend of 7c. per share, and the Colorado and Iron Blossom will pay 8c. each on the shares issued. The latter company passed its dividend in May and the present dividend of 8c. amounting to $80,000 was something of a surprise. It is understood, however, that the company is now producing a good tonnage of high-grade ore, some of which is of better grade than the mine previously produced.

The shares of the Tintic Humboldt Mining Company were recently listed on the exchange. The company is capitalized for $100,000 and owns 10 unpatented claims in the North Tintic mining district three miles from the railroad. Thomas J. Bierpont is president of the company, and the development on the property consists of 80 ft. of shaft and 75 ft. of tunnel work, together with surface improvements. The stock of two other Tintic companies, the McKinley Mining Company and the Eureka Mining Company, was listed on the Exchange last week. The latter company has eight claims in the East Tintic district and is headed by Robert A. Brown, superintendent of the Centennial-Eureka mine.

Goldfield, Nevada

June 16—The authorities of Esmeralda county are making a strong effort to rid the county of "wildcat" miners and grafters. The district attorney, August Tilden, formerly of San Francisco, is looking into everything and seeing that all business for the county is conducted on a fair and square basis. Many of the county officials have been indicted and are out on bonds. The county commissioner from Rawhide, as well as the officials of the defunct bank are implicated.

It is rumored that the district attorney's office has evidence which will amply support the alleged indictments against the officials and directors of certain mining companies, and that this evidence shows a criminal conspiracy on the part of the company to defraud the county and State of their bullion tax.

Cobalt

June 19—The Nipissing Central Railroad Company, which has the franchise for building an electric line between the towns of Cobalt and New Liskeard, has started work on construction. The contract has been let to the Nova Scotia Construction Company, of Sydney, C. B., and it is estimated that the cost will be $125,000. Power will probably be obtained from one of the companies bringing it into the camp. This road will be a great boon to the towns of Haileybury and New Liskeard, as numbers of people now living in Cobalt, will move to the former places, where the natural advantages are much greater. The construction of the line was strongly opposed by Cobalt.

Considerable uneasiness was caused in the early part of the week by bush fires which were burning near the town. At one time the magazines of the Hamilton Powder Company and the Buffalo mine were in danger and also the buildings of the Temiskaming & Hudson bay. A change of wind, however, averted the danger.

Charles Clinton, of New York, has disposed of his interest in the Clinton property, west of the Cobalt Gem, to New York parties.

The Station Grounds Mining Company, owning a narrow strip of land along the right of way of the Temiskaming & Northern Ontario railroad has, up to date, located 18 surface veins, in some of which a little native silver can be seen. The property is seven-eighths of a mile long and varies in width from 99 to 256 ft. As soon as the hydraulic air is in camp two shafts will be started. It will be necessary to purchase the land on which the shafts are to be sunk, as the Railway Commission will not allow them to be sunk on the right of way. The company was purchasing power from the Cobalt Lake and operating one of the shafts, but owing to the expense, these operations have been suspended.

The Monarch claim, west of Sasaginaga lake, has been taken over by New York parties and a force of men will start work on development in a few days' time.

The Temiskaming & Hudson Bay directors have definitely decided to increase the capitalization to $3,500,000, although the final details have not yet been arranged. During the summer a concentrator of about 30 tons capacity will probably be erected.

The Davis Mines, Ltd., owning 170 acres in South Coleman, is following the lead of the Peterson Lake Company and leasing the property in small lots. Three leases have already been executed to the Shamrock, Armstrong and Jacobs parties, while negotians are under way for others.

Gowganda, Ontario

June 18—There has been a good deal of disappointment in the Gowganda district this spring, as the number of people going into the country was not so great as anticipated. More attention is being paid to the Miller, Everett and Shanty Lake sections, and so far they appear to be the most promising of the new districts. The Everett Silver Cobalt Syndicate, has erected two permanent camps at Everett Lake and is employing 100 men. This company owns 21 claims. A find of silver was made on the Cartwright claim, adjoining the Blackburn, at Everett Lake and the vein was traced from the latter property. The Blackburn is one of the best mines in the district and now has a complete plant running. On McRae's property at Shanty Lake, there is silver showing in 11 veins and considerable development has been accomplished. The German Development Company, has a force of men engaged on its claims. On the Burns claim in the same section, a new 2-in. vein of high-grade silver has been encountered.

Toronto

June 19—The Ontario government has disposed of 15 parcels of land, aggregating 283 acres, out of 870 acres of the Gillies Limit adjourning the Cobalt district, recently offered for sale. In all 116 tenders were received, but 100 were rejected as being too small. The total sum received is $74,643. There was no information given as to the value of the land or as to present condition and prospects of the Provincial mine on the limit, so that the sale excited but little interest among mining men. The land is sold subject to a royalty of 10 per cent. on the output and under working conditions.

The Temiskaming & Northern Ontario Railway Commission proposes to make several extensions of the line, including industrial spurs at New Liskeard and Haileybury and has ordered plans and estimates to be prepared for an extension to Elk Lake and Gowganda.

Mexico

June 19—The Mexican Institute of Mining and Metallurgy will hold its first meeting July 12, at Mexico. A charter membership of 100 has been accepted by the provisional council for full membership. A program of technical papers will be submitted at the first meeting and permanent officers chosen by the charter members.

There is revival of talk of zinc smelting in Mexico since the prospect of the loss of the United States market through the pending tariff on zinc ores has arisen. Several concessions have been granted, and the subject is being investigated in the interests of the zinc producers and from an industrial standpoint. Some of the concessions granted contemplate the use of the new electrical processes. It is likely that the zinc smelter, if situated in Mexico, will be in the northern part where there is an abundance of ore and coal. Mexico imported in 1906, which may be taken as a normal year, zinc in the form of ingots, dust and shavings, 293,280 kg.; in the form of perforated sheets for use in cyanidation, 718,376 kg.; and sheets, 701,071 kg. The zinc for cyanidation is admitted free. This importation summary does not take into consideration the amount of zinc coming into the country in the form of galvanized products. The largest importation of zinc is from the United States. If the zinc-ore tariff results in establishing zinc smelters in Mexico, the United States will lose not only the admitted advantage of the docile Mexican zinc ores but also a good market for the zinc products.

The Magistral smelter at Zacatecas has closed after one month's fitful trial. It is alleged that it was defective in construction and costly in operation. The future plans as to the smelter are not yet made known. The independent operators had looked to this smelter as a buffer for better terms than those now offered by the Aguascalientes and San Luis Potosi smelters.

That the Mexican people intend to do everything in their power to control the oil situation in their country is indicated by the formation of a 25,000,000 pesos company, to be known as the Compania Mexicana de Petroleo El Aguila, S. A. (The Mexican Eagle Oil Company, Limited), and of which Guillermo Landa, governor of the Federal district, is president. The company has acquired all the concessions for the development, exploitation and marketing of native crude and refined oils, as well as other kinds of products held by the firm of S. Pearsons & Sons, Limited.

London

June 14—The 50th general meeting of the Institution of Mining Engineers was held in London recently. The president, Dr. B. T. Moore, delivered a presidential address, selecting the production of coal as his subject. The output in Great Britain in 1907 was 267,000,000 tons and in the United States 428,000,000 tons or 40 per cent. of the total production of the world. The largest exporter of coal was Great Britain, the exports in 1907 being 85,000,000 tons. On the question of the exhaustion of the coal supplies, it was stated that the last Royal Commission assumed a quantity in 1901 of 101,000,000,000 tons in Great Britain, which would be worked out in 300 years. Four new papers were presented at the meeting, namely, (1) on "Electricity in Coal Mines," by Robert Nelson, a paper which drew out a good discussion; (2) "Comparison between the Value of Surplus Gas from Regenerator By-product, Coke Ovens and Steam Produced by the Waste Heat from By-product Coke Ovens; with Special Reference to the Evence-Coppée New By-product Ovens," by Mansfeldt H. Mills; (3) "The use of Concrete for Mine Support," by Prof. W. R. Crane, and (4) "Mining in British Columbia, by Mrs. Rosalind Young.

Paris

June 15—The Mokta-el-Hadid company has published its report for 1908. The output of the African iron mines was practically the same as in 1907, a reduction at the Tenez mine being counterbalanced by the Djebel-Hadid mine and the newly opened quarries of Beni-Saf. Outside of these properties this important company is interested in many others. At Aïn-Allega, which is a lead-zinc mine worked with the Ouasta-Mesloula company, the new ore-dressing plant was started in the second half of 1908 and milled about 4200 tons. The Djebel-Djerissa company, managed by Mokta-el-Hadid, produced 115,000 tons of iron ore during the first year of exploitation; the Compagnie de Kroumirie et des Nefzas, also managed by Mokta-el-Hadid, is awaiting the completion of a railway to work its iron deposits. The Mokta-el-Hadid has also large investments in the Compagnie des Phosphates de Gafsa (Tunis), in the Compagnie des Minerais de Fer de Krivoï-Rog (Russia), and in the Société de la Mourière, an iron mine of the Briey district in France. The profits were close to $800,000, and the company has declared a dividend of 50 fr. per share.

The Compagnie Industrielle du Platine did not declare any dividend for 1908. The capital of this company was increased from $3,200,000 to $4,000,000 in order to buy the shares of the Platinum company, and thus assist in securing the control the company hopes to have over all the platinum mines of Russia.

Johannesburg

May 15—A paper was read by Malcolm Fergusson, a government inspector of mines, at the May meeting of the South African Association of Engineers on the "Relation of Safety to Economy in Mining." Some important points were raised and good service will be rendered to the industry by their open discussion. The aim of Mr. Fergusson's paper was to demonstrate that the supervision exercised over underground work upon the mines is inadequate, and that more officials should be employed below to insure safety. Summarizing his views, the author contended that "mine accidents are due to lack of discipline owing chiefly to the fact that there are insufficient officials to supervise the men properly and that the obvious remedy would be not an added expense but actually a great financial advantage to the mine by reason of the increased efficiency.

The principle advocated throughout the paper of throwing maximum responsibility upon the shoulders of the shift bosses does not meet with general approval. Under present systems it is, as a rule, possible for the energetic shift boss only to visit all the working places under his control once a day in accordance with the demands of the mines and works regulations. It is consequently necessary to rely upon the gangers in direct charge of the hammer "boys" or the machinemen to see that the requirements of safety are properly observed. These latter alone can see that the Kafirs do not drill into sockets or misfired holes, or commence work under dangerous hanging—for in the majority of places the day's work must necessarily be far advanced before the mine official puts in an appearance. The mine captain or shift boss should, of course, be responsible for the employment of men capable of judging these matters and should ascertain as far as possible that the proper precautions are taken, but it is unreasonable to expect shift bosses, with duties as falling to them at present, to make the initial inspections themselves before the commencement of work. Mr. Fergusson apparently opposed his own arguments when he urged that "the safety of a mine depends, from hour to hour, it might be said almost from minute to minute, upon the care and attention bestowed upon every portion of it by the mine officials." It is true that much reliance cannot be placed upon the perspicuity of the Kafir laborers—though often very trustworthy judges of their personal security—but it is too much to hope that a sufficiently large staff of mine officials can be provided for our large mines, with workings stretching for half a mile or more along the strike of reef and on many levels to relieve the individual worker from the responsibility of protecting his "boys," or even his fellows from danger. There is already too great a tendency to make the Rand miner an automaton and to rob him of all opportnuities of doing good work as a thinking man of independent responsibilities.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

NOME

The fleet of steamers from Seattle reached here earlier than last year, reporting less ice than in previous years.

VALDEZ

An automobile stage service for the benefit of mining interests between Valdez and the Summit, 30 miles distant, via the Valdez-Fairbanks wagon road will be inaugurated August 1. The cars will carry freight and passengers.

Arizona

GILA COUNTY

Superior & Boston—A battery of two 150-h.p. boilers, and a Nordberg hoist and compressor are being installed. The McGaw 3-compartment shaft is now 400 ft. deep, and is to be equipped with double-deck cages.

Old Dominion—The May production of copper is reported as 3,088,000 pounds.

Two Queens—In the Federal Court at Kansas City, Horn Brothers, Raymond P. May and S. H. Niger, were charged with using the mails to defraud in promoting the "Two Queens" group of mines at Wilhleman, Ariz. James B. Lynch of Philadelphia, produced letters, circulars and newspapers sent to him by the promoters. These stated that the mine was in operation and that ore was being shipped in paying quantities. Lynch bought 1100 shares of stock on representations made in the advertising matter.

J. H. Deaner, of Saginaw, Mich., testified that he bought stock on the instalment plan, paying $2 a month. District Attorney Van Valkenbergh offered as evidence a printed circular describing the mining property. Frank H. Horn, S. H. Snyder and Raymond P. May, were sentenced to serve a year and a day in the United States prison at Leavenworth and to pay a fine of $500 each, while John E. Horn was fined $500 in the Federal court. Appeal bonds in each case were filed.

GRAHAM COUNTY

Shannon—An important strike of ore was made recently at the Little Coronado on the 400-ft. level. A new 60-h.p. engine is to be installed.

Shannon-Arizona Railway—The directors of the company are Nathan L. Amster, E. B. Clough, both of Boston; John W. Bennie, R. D. Roberts and Jas. A. Campbell, of Clifton. The company is capitalized at $50,000 divided into 500 shares of par value $100 each.

Detroit Copper—A flume has just been completed from the concentrator around Longfellow hill to the gulch southeast of Morenci. This is to take care of the tailings and prevent them from going into the San Francisco river. An oil-burning boiler of the Morenci smelter exploded last week. Five men were badly injured.

Messabe-Morenci Development Company—The directors of the company are Richard Lakenau, president; Dan Grant, vice-president; I. H. Knapp, secretary and treasurer; and C. E. Muir, all of Morenci. Hon. F. H. Hereford, of Tucson, is general counsel; Frank Rathbun, mining engineer; M. Danenhauer, of Clifton, is statutory agent.

County Road—The board of supervisors of Graham county has asked for bids for the construction of a public highway leading from East Clifton to Patterson's addition on the east side of the San Francisco river. Office at Solomonville.

Fumarole—The mine is being developed by the National Mining Exploration Company, of which F. A. Woodward is general manager.

California

SHASTA COUNTY

El Dorado—This mine, at Tower House, has been sold by Sherk Brothers to W. H. Roller. There is a small mill at the mine.

Mammoth—About $50,000 worth of improvements will be made in July, in enlarging the blast furnace building and changing the converter crane.

SISKIYOU COUNTY

High Muck-a-Muck—The claims owned by Charles and Henry Herzog, near Etna Mills, are being opened. The railroad company opposed the patenting of the claims on the ground that they were not on mineral land, but the commissioner of the general land office has decided in favor of the Herzog brothers.

TRINITY COUNTY

Trinity River—This company, at Lewiston, has recently completed a long tunnel, and is now hauling in the heavy machinery for a hydraulic elevator.

TUOLUMNE COUNTY

The United Mines Corporation and Albany Pacific Mining Company have leased to E. N. Baker, of Cleveland, O., the Dead Horse, Eureka, Lady Washington, Golden West, California, Grizzly, New Albany and Mill Site. The lease is for 10 years and the lessee is to pay $40,000 of debts on the properties.

Ralph—Operations will be resumed, the mine having been sold by the Bagdad-Chase Mining Company to San Francisco men.

Colorado

BOULDER COUNTY

Golden Message—A new hoisting plant is being installed on the property, near Sunshine, by Dr. Curtis Brown as trustee for the stockholders. A large body of milling ore is reported to have been opened.

John Jay—Under the direction of J. A. Bentley, of Denver, the mill near Jamestown will be overhauled. A roaster is to be installed and cyanide tanks added.

CLEAR CREEK COUNTY

Columbia and Eureka—Chicago people have become interested in this property, and are planning extensive development. Manager E. J. Butts, Georgetown, Colo., will later make arrangements for the installation of machinery.

Philadelphia—This company has leased the Dover-Brighton mill on Fall river and will start milling during the coming week. J. W. Boyd, Idaho Springs, Colo., is manager.

Lamartine—The dump has been leased by Oxley & Noonan, Idaho Springs, Colo., and will be hauled to the Jackson concentrating mill at Idaho Springs for treatment. There is estimated to be 50,000 tons in the dump.

Josephine—It is reported that electric drills are to be installed at this property. L. W. Partridge, manager, Georgetown, Colo.

Astor-Stewart—The company will install an air compressor and drills for use in its Scepter tunnel on Democrat mountain near Georgetown.

GILPIN COUNTY

Pine Cone—E. Shoush, of Macon, Mo., has taken a lease on this property near Black Hawk, Colo., and will install machinery.

Evergreen Gold and Copper—Manager Etienne A. Ritter, of Colorado Springs,

is having an 80-h.p. boiler installed in the mill which is to be overhauled to handle the dump and determine the treatment for the bornite ores. The property is situated in the Pine creek district.

Decatur—The company holdings in Moon gulch were sold this week at sheriff's sale to satisfy a judgment of $4325. Decatur, Ill., people are interested and it is understood that they will reorganize and carry on active development on the property, near Rollinsville, Colo.

Sea Bird—Oklahoma people have become interested in this group in the Pine district and it is reported that machinery is to be installed. G. W. Hines, Rollinsville, Colo., is to be in charge.

Hawley-Gardner—William Dickerson, of Bald Mountain, Colo., has started work at this property in the Nevada district; the machinery is being overhauled and arrangements made for active developments.

Aurora—A deed has been recorded conveying from E. E. Clark to H. G. Shuck this claim in the Russell district for $16,000. Pittsburg people are reported to be the new purchasers. P. R. Alsdorf, Central City, Colo., will be superintendent.

A. K. R—Decatur, Ill., people interested in the Smuggler mine have opened up between 5 and 6 ft. of ore in the lower workings which is running high by amalgamation and the concentrates carry much better than average values. The Smuggler retort gold sells to the Denver mint at $19.50 to $19.80 per oz. The company during the past week has purchased claims adjoining their own, giving them 3000 ft. on the line of the Smuggler vein. G. M. Ashmore, Rollinsville, Colo., is manager.

Pearl Tatum—A 5-drill Rand compound compressor is being installed at the Sleepy Hollow mine, and deeper development will follow. Floyd Weed, Black Hawk, Colo., is superintendent.

Cashier—This company controlling the Pittsburg-Meeker mine is figuring on the installation of an electric compressor and pumps. W. Auger, Central City, Colo., is superintendent.

Gladstone—Eastern people are reported to have assumed control and E. H. Crabtree, Central City, Colo., is to have charge of this mine.

Penobscot—This company contemplates adding another compressor plant for driving their tunnel. P. J. Hamble, Rollinsville, Colo., is manager.

LAKE COUNTY—LEADVILLE

Birdella—The breast of the tunnel is in 400 ft., and another 100 ft. is to be driven to cut the President vein.

Pyrenees—After several mishaps the pumps are again at work and the unwatering of the lower levels is only a question of a few weeks. The company, in unwatering the lower levels, is also draining the Greenback and the Mahala.

SUMMIT COUNTY

Robinson—At this old mine, at the town of Robinson, a 150-ton concentrating plant will be installed. The usual concentrating machinery, such as tables, jigs, etc., will be employed; also magnetic separators. The work is in charge of O. H. Fairchild, mining and metallurgical engineer, 202 Exchange building, Denver, Colo.

Indiana

GREENE COUNTY

The Pea Fry mine has made a contract with a large steel concern at Gary to take the output of the mine for the entire summer season. This will give steady employment to about 200 men.

SULLIVAN COUNTY

Keystone—The fire which started four weeks ago is still burning, but is being gradually smothered and within a week or 10 days is expected to be out entirely. The fire does not interfere with work in any other part of the mine.

VERMILLION COUNTY

Deering—Falling slate in Deering mine No. 8, in the Clinton field, killed two Polish miners on June 13. As the result of a visit by mine inspectors, Joseph Robinson, mine boss and George Kyle a shooter in the same mine No. 8, paid fines for violating the mining laws. Robinson was charged with failing to provide a separate current of air for each 50 men, and Kyle pleaded guilty to having "drilled on the solid," this term refering to the practice of making the hole into the coal deeper than the distance undermined by the machines.

Kansas

ZINC-LEAD DISTRICT

A tract known as the Happy Hollow mining land, southeast of Galena, has just been sold by Rains Brothers to Decker & Co., of Joplin, who will take up the work of developing the land at once.

Michigan

COPPER

Michigan—Over 300 ft. of drifting has been done in the adit on the Bee tract and about half the distance high-grade rock was exposed. This lode has also been cut by means of crosscuts from the "C" shaft, which is 650 ft. east of the adit opening. This lode has also been exposed at the 9th and 11th levels and at these points it was found richer than at the level above. The openings throughout are of a most encouraging nature. At the 17th level of the "A" shaft a crosscut was driven to cut the Calico lode and at the point of intersection was found about 4 ft. wide and highly mineralized.

Tamarack—Rock shipments of about 350 tons daily are being made from No. 5 shaft to the Calumet & Hecla stamp mills. In this way a comparative test can be made on the character of the rock, stamping methods, and tailing losses.

Wyandot—Drifting has been started on the recently opened copper-bearing formation. This lode carries but a small amount of copper. Its further opening will be awaited with interest.

Osceola—This company continues to maintain its increased production. During the month of May about 122,000 tons of rock were stamped, yielding nearly 2,622,000 lb. of mineral.

Allouez—No. 2 shaft of this company is now sinking on the formation. This shaft was put down about 2300 ft. through barren ground before the vein was encountered. Work on the two-head addition of the stamp mill, which is owned jointly by this and the Centennial is nearing completion.

New Arcadian—Robert H. Shields, president, has returned from a visit to the east, and while there perfected all the details in connection with the transfer of the Arcadian to the new company. Active operations are to start about July 1. This company owns 3200 acres of land in the mineral zone, and a complete equipment. The old shaft is down about 200 ft., and will be reopened. A drilling outfit will be rigged up at the bottom to ascertain the condition of the formation at depth. The tract will be thoroughly prospected by drilling.

Aztec—A meeting will be held early next month, when plans will be formulated for the beginning of active exploratory work. This tract contains 320 acres located between the Adventure and Lake properties.

IRON—GOGEBIC RANGE

Colby—Work has been suspended at this mine and the Ironton, near Bessemer, both owned by Corrigan, McKinney & Co. It is said that trouble with the local authorities about taxation is the cause.

Coppo—The Whiteside Exploration Company is drilling at this old mine and on the adjoining lands, near Marenisco.

IRON—MARQUETTE RANGE

Volunteer—This mine in the Cascade district is being thoroughly tested by drill.

MENOMINEE RANGE

Baker—Development is well advanced, and some shipments will be made this year from this mine, which is at the western end of the range.

Channing-Gibbs—This property at Red Rock, near Amasa, is approaching the producing stage, and a half-mile spur is being built to connect with the Chicago, Milwaukee & St. Paul road.

Stansbaugh District—Testing work and drilling are being carried out on several

forties by the Cleveland-Cliffs Iron Company. The Buffalo & Susquehanna Company is reopening the old Chicagon mine and sinking the shaft 200 ft. deeper.

Minnesota

Iron—Cuyuna Range

Much exploration is going on this season, and it is hoped that the value of some of the properties will be definitely established. So far, the interest in the range has been largely of a speculative kind.

Interstate Mining Company—This company has been adding considerably to its holdings on the range. It is controlled by the Jones & Laughlin Steel Company.

Iron—Vermillion Range

Section 30—Active work on this property is being carried on under direction of George A. St. Clair and Alfred Merritt, of Duluth. The showing is very good in No. 1 shaft which is now down 700 ft. In No. 2 good hard bessemer ore has been found.

Missouri

Howell County

Carson—The Frisco Ore Mining Company has abandoned this mine. The machinery is being torn down and a portion of it shipped to St. Louis. The mine has been operated by this company for seven years, and during that time about 3000 cars of ore have been shipped to the St. Louis Blast Furnace Company.

Joplin Zinc-lead District

The large area of disseminated ore ground west of Joplin is now assured of four more mills. Much drill work is being done. Three large mining properties were recently sold at handsome figures. The Elking, north of Webb City, for $100,000; the Keystone, south of Webb City and High-grade mine at Central City, price not stated.

Big Fly—The erection of this mill on the lease of the Louisville Lead and Zinc Company, of Joplin, just west of Chitwood camp, is proceeding rapidly and the building is almost completed.

Barefeet—This Joplin company is taking out a good tonnage of rich ore from the old Cardinal ground at the Midway tract.

Kalitan—R. K. Pitkin has sold his control of this company to John T. Robertson, of Joplin.

Knights Station—Four exceptionally rich zinc prospects have been drilled at depths ranging from 125 to 185 feet.

On adjoining land, to the West, there has been developed one of the greatest silicate prospects ever seen in the southwest. The ore is found under the surface at about 4 ft. The earth is removed with scrapers and the silicate is blasted out as one would blast limestone from a ledge.

Maltese Lead and Zinc Company—This Joplin company will begin operations west of Joplin in the Central City district.

Midnight—Dr. George E. Ladd, of Wilburton, Okla., is making arrangements to resume operations on his property at Zincite. A 5-in. steam pump was installed recently.

Lone Star—Articles of incorporation were filed at Carthage. The company owns mining property near Knights' station. C. J. Tobins, of Carthage, is one of the principal owners.

Integrity—Work has begun on a 250-ton milling plant to take the place of the one destroyed by fire last year.

O.K.—After a shutdown of 5 months, the mill began operations last week. The mill has been remodeled, and has a capacity of 100 tons daily.

Sampson—The mill is to be operated by electric power, and has a capacity of 250 tons per day. It is a new plant and will begin treating ore soon.

Herald—The 300-ton plant resumed operations June 18.

Montana

Butte District

Amalgamated—At the Pennsylvania mine an air shaft has been constructed down to the 1600-ft. level and has materially improved the ventilation. At the 1200-ft. level in the air shaft a blower with a capacity of 60,000 cu.ft. per minute forces the air downward. The shaft is now down 1800 ft. and the principal work is being done on the 1400-, 1600- and 1800-ft. levels. Between 1000 and 1200 tons are being hoisted daily. At the Mountain View mine a 400-gal. electric pump has been installed. On the 1200-ft. level of the Leonard mine two Nordberg pumps with a capacity of 600 gal. each are in use. At the Badger State mine sinking on the shaft has been resumed. The shaft at present is 1200 ft. deep and will be sunk to the 2000-ft. mark. At the Red Bower mine the shaft is now being sunk from the 300- to the 600-ft. level. Those in charge of the Amalgamated properties in Butte state that its operating companies, together with the North Butte, are producing at the rate of 14,000 tons of ore daily. Of this amount the Washoe smelter, at Anaconda, treats 10,000 tons and the Boston & Montana smelter at Great Falls treats 4000.

Jefferson County

Alta-Montana—C. C. Titus, formerly superintendent of the independent smelter at Ponderay, Idaho, has been placed in charge of the work at the Alta mine.

Assets Gold Mining Company—The company has recently been incorporated under the laws of Montana with a capital stock of $3,000,000, with 600,000 shares of the par value of $5. The incorporators are W. W. Barr, of Seattle, George Northup, of Grand Rapids, Mich., and James A. Barr, of Houghton, Mich. The company will operate the Farlow group of claims situated four miles from Jefferson City.

Lewis and Clarke County

Gold Crown—The new 80-ton mill has been put in operation under the direction of W. J. Heiber. The mill is thoroughly equipped with a Blake crusher, Fraser & Chalmers rolls, revolving screen, hydraulic classifier, six-compartment jig, elevators, Wilfley tables, a 70-h.p. boiler and 50-h.p. Atlas engine. The main shaft is down 250 feet.

Nevada

Esmeralda County—Goldfield

Florence Goldfield—A new discovery of high-grade ore was made last week on the Engineer's vein on the fourth level from the main shaft. The foundations are under way for the extension to be added to the mill. The tube mill and extra tables are expected about July 1, which will increase the capacity to about 175 tons per day. The old Reilly Lease workings are now being put in shape for production of ore. At the meeting held in Denver June 7, a dividend of 10c. per share, amounting to $105,000 was declared.

Nancy Donaldson—A hoist is being installed on this Red Mountain property, about eight miles northeast of Goldfield. The property, consisting of four claims, is managed by J. C. MacCormack, of Goldfield, and the work will be in charge of John T. Hawkins, who is also manager of the James Burns interests in Goldfield.

Esmeralda County—Lucky Boy

Mitchell Fairfield Lease—A 100-h.p. hoist and 10-drill compressor are being installed on this property. The shaft is now 200 ft. deep and shows ore of a good grade.

Hubbard Lease—About 70 tons of ore are being shipped daily. The lease has less than 60 days to run.

Esmeralda County—Rawhide

Rawhide Queen—The Grutt Balloon lease recently struck good ore on the 185-ft. level. The ledge is 7 ft. in width, and will average about $48 in gold per ton. This is the best strike that has been found in the camp.

Original Rawhide—The Kerns No. 1 lease on the Queen Estate has struck ore on the 150-ft. level, assaying $18 to $20 per ton. Not enough work has been done to determine the size and value of the strike.

Rawhide Coalition—The Coalition Crown lease is now installing a 12 h.p. hoist and a 40-ft. gallows frame. The shaft is down about 90 feet.

Bovard-Swastika—Extensive operations on the Buckskin group of claims will

begin soon. The property is about 22 miles south of Rawhide. The main office is at 181 La Salle street, Chicago.

LINCOLN COUNTY

Alunite—It is reported that the Alunite Mining Company has purchased three fractional claims from "Jack" Hayes and associates. The price is said to be $25,000.

LYON COUNTY—YERINGTON

Wabuska Copper—Recent development work on the 500-ft. level of this property has disclosed promising orebodies, the copper content being in excess of 3 per cent. The property is to be equipped with a compressor, pump and larger hoist, and it is reported that the company intends building a smelter.

NYE COUNTY—BONNIE CLARE

Bonnie Clare—This recently reorganized company is leasing its mining properties and for the present will operate the mill only on company account, working over the tailings of which there are about 4000 tons. Later a tube mill and additional concentrators will be added and the mill operated as a custom mill. A. J. Trumbo, of Bonnie Clare, is in charge of the work.

NYE COUNTY—BULLFROG

Montgomery-Shoshone—The final clean-up for the month of May showed a production of $50,000. At present the mill is treating between 200 and 220 tons of ore per day. Approximately 5000 tons of good milling ore have been developed on the 500-ft. level. The stope on the 300-ft. level is 100 ft. long and 12 ft. wide.

National Bank—J. C. Kennedy and others have secured a two years' lease on this property, and intend to push development work as fast as possible.

Mayflower—The output for May was $10,700, from 390 tons of ore treated. A saving of 92 per cent. was made. The ore is from the stope between the 200- and 300-ft. levels.

Rickard-Garburg Lease—Ore of a high shipping grade was broken into last week in the winze 15 ft. below the tunnel level. The ledge shows from 4 to 5 ft. in width. Average samples taken across the entire vein return values from $50 to $200 per ton. A shipment comprising about 30 tons is sacked and will be sent out this week. The main shaft is being pushed down by three shifts, and a crosscut will be run to cut the ledge at the 200-ft. level.

Tramps Consolidated—A carload shipment from the Jingles & Clothier lease, valued at $25 per ton was made last week, to the smelter at Needles.

Bullfrog Pioneer—Shipments from this property are now being made at the average of 75 tons per day. A car of high-grade ore was shipped last week, which netted the company in excess of $10,000 for the car. The entire product of the mine is being handled by the Western Ore Purchasing Company.

NYE COUNTY—TONOPAH

Belmont—The old Belmont shaft has been unwatered and preparations are now being made to connect with the east crosscut on the 1000-ft. level, 450 ft. below. A hole 6 or 8 in. in diameter will first be made with a churn drill to afford better ventilation in the work of raising the three-compartment shaft from the 1000-ft. level. Extremely good-grade ore 4 ft. thick has been exposed on the 1000-ft. level.

MacNamara—A new body of high-grade shipping ore was opened last week in the winze from the west drift on the 200-ft. level. The vein is 6 ft. wide and of shipping grade across its entire width. The new compressor which is to be installed should reach the mine about June 25.

Tonopah Mining—A less amount of development work than usual is now being performed, due to the lack of compressor capacity. The shaft is still being sunk, and is now below the 1400-ft. point. The month of May showed the best record ever made at the mill, 14,480 tons of ore being crushed which returned over $230,000 in bullion and $50,000 in concentrates.

New Mexico

SOCORRO COUNTY

Top Development Company—The Top Mining Company has been reorganized into a development company, capitalized at $650,000. The property is in the Mogollon district. E. A. Wayne is principal stockholder.

Oklahoma

There will be an investigation conducted during the summer on the mineral resources of Oklahoma by the Oklahoma Geological Survey. The plans now developed will consist largely in the investigation of portland cement and clay products in the northern and eastern parts of the State, and a study of the asphalt deposits in several of the southern counties. Prof. D. W. Ohren, L. L. Hutchinson and Ben C. Bolt will have charge of the fieldwork.

Oregon

LANE COUNTY

West Coast—The clean-up made June 1, after six days' run resulted in obtaining $2500. Superintendent Ryan states that the mill will be closed down for a short time in order to make some necessary adjustments and improve the ore-transportation system.

Mayflower—W. P. Ely, of Kelso, manager, reports that the mill was started May 1, and that he expects to put 500 tons of ore through, as a trial run, using the cyanide process. This is the first cyaniding done in the Bohemia district.

Combination—Rich silver ore has been discovered in one of the lower tunnels. Milling operations will begin soon and the concentrates will be shipped to the Tacoma smelter.

Pennsylvania

ANTHRACITE COAL

Ferndale Colliery—This colliery is to be closed down in consequence of a decision recently rendered. The miners at the colliery, which is owned by the Hillside Coal and Iron Company—the Erie railroad—appealed to the Board of Conciliation, their complaint being that the company was not paying sufficient wages for rock work. The board after hearing the case decided against the company and held that the price for rock work should be $2.20 per yd. The company, of course, accepted this decision and paid the men at that rate up to date, but decided to close down the mine on the ground that it was too expensive to work. This is said to be the first case since the Board of Conciliation was appointed in 1903, when one of its decisions resulted in closing a colliery.

Kingston Coal Company—The new coal breaker No. 2 of this company last week passed all records for a day's work. In one day 1410 cars were raised through the shaft and slope and all the coal passed through the breaker, making a total of 4300 tons over the screen. The breaker was recently overhauled and rebuilt, being furnished with all the latest improvements, such as spiral conveyers, Emery slate pickers and others. The work was done under the direction of F. E. Zerbey, general manager of the company.

BITUMINOUS COAL

Pittsburg Terminal—All the coal mines in the Pittsburg district along the West Side Belt railroad, which belong to the Gould interests and which were formerly operated by the Pittsburg Coal Company, have been placed in operation under the management of the Pittsburg Terminal Railroad and Coal Company. The mines have been idle for some weeks, during which time new machinery for loading cars has been installed, and other improvements to facilitate the handling of coal over the Wabash lines were made. B. F. Bush, receiver of the Western Maryland railroad, is president and J. J. Keefer, formerly general manager of mines of the Monongahela River Consolidated Company, is vice-president and general manager in charge of operation.

The 500 steel hopper cars ordered some time ago by the Wabash-Pittsburg Terminal railroad are being delivered at the rate of 25 per day by the Standard Steel Car Company, and a large number of them have been placed in service to handle the output of the West Side Belt mines.

Utah

BEAVER COUNTY

Cupric Mines—The shaft has been penetrating bunches of copper ore for some time but at a depth of about 300 ft. the ore showing became more favorable and has continued to improve as the work progressed. L. Morris, general manager, Beaver, Utah.

Cave—A car of copper ore was recently marketed, averaging 17.5 per cent. copper. The management now plans to ship copper ore regularly and to take out at least one car of iron ore per day.

JUAB COUNTY

East Tintic—The latest strike made in the Ralph claim of this company is in the shaft at a depth of 314 ft. At that point 14 in. of high-grade silver ore has been cut. It is of different character from that which has been opened in the cave 60 ft. farther east; it is quartz ore running lower in lead but higher in silver content than the cave ore.

SALT LAKE COUNTY

Utah Copper—The record output at the Utah Copper mine at Bingham was made on June 13. On this day this company handled the greatest tonnage of ore in its history. During the day 249 cars of 55-ton capacity amounting to 13,700 tons of ore left the mine for the mill at Garfield.

Ohio Copper—The first section in the new mill of the Ohio Copper will be ready to go into commission in about two weeks but it is probable that the management will defer operation until the mill is sufficiently completed to treat 3000 tons of ore per day. This would only be about two months longer and in that time the mine could be completely opened down to the 1400-ft. or Mascotte-tunnel level and a large and steady output easily maintained.

TOOÉLE COUNTY

Western Utah Copper—Superintendent J. E. Bergh reports having driving 100-ft. on the 300-ft. level since operations were taken up at that point. Work has also been started on the 600-ft. level.

Washington

FERRY COUNTY

Blacktail—The fourth car of ore was shipped to the Tacoma smelter last week.

SKAGIT COUNTY

Anacortes—T. F. Thomas, Ballard, Wash., and associates of Seattle have purchased a talc mine from Thomas Sharp, seven miles west of Anacortes for $75,000, the first payment of $10,000 having been made; the balance to be paid in monthly installments.

Wisconsin

ZINC-LEAD DISTRICT—PLATTEVILLE

A company of 30 shareholders has been formed to drill for lead and jack on the Weigle and Billmeyer tracts southwest of the Klar-Piquatte.

Badger—The Galena Iron Works have contracted to construct a small milling plant for this company four miles southwest of Dodgeville; Geo. Lindsey, of Dodgeville, is in charge of the mine.

Dark Horse—A 50-ton mill is to be put up.

Ellesworth—W. N. Smith, of Platteville, has purchased the Empress mill for removal to this mine, at Livingston.

Optimo—Foundations are being laid for a 50-ton mill at this mine, at Linden; Jas. Billingsly, of Galena, Ill., is general manager.

Wisconsin—A new shaft is being sunk on the Longhenry land by The Wisconsin Zinc Company. This company has obtained options on the Kennedy mine, at Hazel Green, and the Pittsburg-Benton, at Benton.

Weigle—This has been re-organized as the Standard Zinc Company, and a force of men put to work at the mine.

Canada

BRITISH COLUMBIA—QUEEN CHARLOTTE ISLANDS

Small quantities of placer gold are being recovered by miners working on the east coast of Graham island.

Preparations are being made to take in a diamond drill to prospect coal measures occurring in the Yakoun district of Graham island.

A 2-ft. vein of gold quartz is being prospected on the Gold Harbor claim, west coast of Moresby island.

BRITISH COLUMBIA—ROSSLAND

Consolidated Mining and Smelting Company—Another copper furnace, described as the largest in Canada, has been blown in at Trail. There are now four copper furnaces at these works, having a total treatment capacity of about 1800 tons of Rossland ore per day.

Le Roi No. 2—For the purpose of developing the extension of one of Le Roi lodes, which dips into the Annie claim of Le Roi No. 2 group, a shaft is to be deepened from 900 to 1200 ft. Present dimensions of the shaft—6x16 ft.—will be maintained to the 1200-ft. level. It is estimated the cost of the work will be about $18,000 and that it will take eight months.

QUEBEC

Two distinct booms are in progress in the southern part of the Province. One is in asbestos, and is largely due to the formation of the Amalgamated Asbestos Company. Property in the asbestos district—and anywhere near it—is held at high figures, in some cases out of all season.

The other boom is in placer gold in the Beauce and Compton districts, where placer mining on a very small scale has been carried on for years, but there has never been any production of importance.

Compton Gold Dredging Company—This company's agents having failed to come up to their agreement to provide funds for a dredge by May 1, Kennedy & House, of Beebe, the owners, have demanded the surrender of the property.

Eastern Canada Mines Company—This company, it is stated, has arranged to sell the Chat Noir placer.

Eastern Canada Smelting Company—This company is sinking a shaft on the McDonald copper claim at Weedon, on which it has an option.

Mexico

CHIHUAHUA

Midland—D. M. Evans, manager, reports that development work is opening bodies of high-grade lead-silver ore.

Rio Plata—D. W. Shanks, general manager, reports an important strike in the Santa Barbara mine. Only 15 out of 25 stamps are in operation, due to lack of water.

San Toy—The management announces that the balance of the floating debt has been paid. The amount of this debt, Jan. 1, was $215,653. The funds for this came from the net profits on the ore sold since that date.

MEXICO

Mexico Mines of El Oro—Report for May: Mill ran 22 days and crushed 7334 tons of ore, yielding bullion valued at $100,760; working expenses $32,990; development $5900; net profit of $60,870.

El Oro—Report for May: Mill No. 1 ran 25 days and mill No. 2 operated 23 days, crushing 20,927 tons of ore, yielding bullion valued at $186,480; working expenses, $100,020; development $22,600; net profit $63,860; profit on railway $6000; expenditure on permanent improvements $7000.

SONORA

Greene-Cananea—A concession has been granted for building a railroad from Imuris, on the Sonora railway, east, through northern Sonora, to a point on the Mexican Central in Chihuahua. Chas. S. Henning, with an office at Douglas, Ariz., is chief engineer.

Australia

VICTORIA

The gold production for the five months ended May 31 is reported at 268,909 oz. fine, or $5,558,349 in value.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, June 23—The bituminous coal trade in the East continues to show an improvement which is not marked, but rather steady. Steam coal is in better demand, which indicates an improvement in business generally.

The anthracite trade is a little more active than it has been, and most of the companies are running their collieries at a nearer approach to full time.

Fair reports come from the trade in the West. Steam coal is in better demand and the large consuming centers are calling for more shipments. In part, perhaps, this is a result of the recent policy of keeping shipments down closely to avoid demurrage sales, but in part it is due to a real increase in demand.

The Lake trade is looking up and shipments have been increasing. Up to this date they are considerably above those of last year; sufficiently so to promise a good season total.

Tariff on Coal—Much interest is taken in the question of the tariff on coal, and especially on the question of a reciprocal arrangement with Canada. Many Pennsylvania shippers favor such an arrangement because they have a large trade with Canada; but West Virginia men are opposed because they are cultivating the New England trade and do not want to come into competition with Nova Scotia coal. A similiar local division of opinion exists in Canada itself. Nova Scotia miners are opposed to reciprocity, fearing to lose Canadian trade; Ontario favors it as a means of getting cheaper coal; while British Columbia also favors it owing to its large trade on the Pacific Coast.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to June 12, short tons:

	1908.	1909.	Changes.
Anthracite	2,469,413	2,347,762	D. 121,651
Bituminous	14,419,474	15,613,741	I. 1,194,267
Coke	3,051,632	4,444,043	I. 1,392,411
Total	19,940,519	22,405,546	I. 2,465,027

Increase for the week, 117,610 tons. Total increase year to date, 12.4 per cent.

Coal tonnage passing the locks on the Monongahela river, four months ended April 30, was 2,584,820 short tons in 1908, and 3,206,720 in 1909; an increase of 621,900 tons.

Coal passing Davis island dam on the Ohio, four months ended April 30 was 961,215 short tons in 1908, and 1,756,345 in 1909; increase, 795,130 tons.

Coal receipts at St. Louis, four months ended April 30 were 2,374,541 short tons in 1908, and 2,267,188 in 1909; decrease, 107,353 tons.

Coal shipments by water from Seattle and Tacoma, Wash., four months ended April 30, were 212,180 tons in 1908, and 95,554 in 1909; decrease 116,626 tons. These shipments are mainly to California and Alaska.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, four months ended April 30, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	6,434,050	1,302,873	7,736,923
Buff., Roch. & Pitts.	1,849,644	147,557	1,997,201
Buff. & Susquehna	484,838	107,161	591,999
Penn. lines, N. Y. C.	2,503,959	29,908	2,533,867
Pitts. & L. Erie	2,239,786	1,326,911	3,566,697
Norfolk & Western.	3,870,163	835,823	4,705,986
Ches. & Ohio	3,826,493	155,932	3,982,425
Total	21,208,933	3,906,165	25,115,098
Total, 1908	18,890,852	2,596,113	21,486,965

Total increase this year, 3,628,133 tons, or 16.9 per cent. In addition the Baltimore & Ohio carried 281,493 tons of anthracite in 1908, and 322,459 in 1909; an increase of 40,966.

Coal tonnage of railroads in Ohio Coal Traffic Association, four months ended April 30, short tons:

	1908.	1909.	Changes.
Hocking Valley	741,635	883,090	I. 141,455
Toledo & Ohio Cent.	306,283	326,008	I. 19,725
Baltimore & Ohio	537,275	345,887	D. 191,388
Wheeling & L. Erie	784,542	875,044	I. 90,502
Cleve., Lorain & Wh.	755,525	616,338	D. 139,187
Zanesville & Western	373,305	348,283	D. 25,022
Toledo Div., Pen. Co.	550,890	582,575	I. 31,685
L. Erie, Alliance & Wh.	328,427	331,304	I. 2,877
Marietta, Col. & Clev.	22,399	21,430	D. 969
Total	4,400,281	4,329,959	D. 70,322

The total decrease in shipments this year was 1.6 per cent.

Coal tonnage of Chesapeake & Ohio railway, 10 months from July 1 to April 30, short tons:

	Coal.	Coke.	Total.
New River	5,378,470	221,038	5,599,508
Kanawha	4,195,853	24,498	4,220,351
Kentucky	287,784	.....	287,784
Connecting lines	200,789	69,795	270,584
Total	10,062,896	315,331	10,378,227
Total, 1907-08	8,957,603	295,513	9,253,116

Deliveries this year to points west of mines, 4,987,388 tons coal and 179,400 coke; points east, 1,278,800 tons coal and 135,931 coke; tidewater, 3,606,317 tons coal; anthracite to line points, 7598 tons.

New York

Anthracite

June 23—The anthracite trade is looking up and business has been rather more active. This is partly to be explained by the approach of another 10c. rise which will be due next week. The Reading company is reported to be running all its collieries five days during the week, and some other companies are running on full time.

Until July 1 there will be no change in prices. We quote for prepared sizes, $4.45 for lump, and $4.70 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes current quotations are unchanged at $3.10@3.25 for pea, $2.35@2.50 for buckwheat, $1.70@2 for rice or buckwheat No. 2, and $1.25@1.50 for barley, f.o.b. New York harbor points.

Bituminous

A little more interest has been shown in the market, notwithstanding the general hot weather of the week. Manufacturers are evidently needing more coal and are beginning to think of laying in winter stocks, especially in the far Eastern ports. Inquiries from that section are coming in and the Sound is also buying more coal. New York harbor continues a weak spot, but matters are looking up even there. Prices remain the same at $2.40@2.50, f.o.b. harbor shipping port, for lower grades and $2.60 up for better coal. All-rail trade is improving a little. Cars are plenty, but transportation still rather slow.

The English coal troubles are still attracting atention. The recent sharp advance on export coal at Cardiff, it is thought, may be the means of throwing some South American trade this way, and some shippers are negotiating for vessels to be ready for such a movement.

In the Coastwise trade vessels are still in good supply and there is little or no change in rates. From New York cargoes are taken at 60@65c. to points around Cape Cod.

Birmingham

June 21—Coal mining in Alabama shows improved conditions and the output is better than it has been for some time, with a steady demand coming in. Recent orders placed indicate that consumers are looking this way for their needs. The Central of Georgia railroad will need something like 80,000 tons of coal from this section between now and the end of the year.

Chicago

June 21—Buying of steam coals continues quiet but steady; the summer demand for fine coals makes itself strongly felt, and lump from Illinois and Indiana

mines is very weak. Domestic buying is very light. Shipments of western lump to this market are too large and should be curtailed. Eastern coals are again too plentiful and show old-time conditions of demoralization of prices to escape demurrage charges. Competition is keen for any good order of either eastern or western, with the result of further lowering of prices. The summer business, it should be borne in mind by shippers and prospective shippers, is in this market essentially of fine coals.

Illinois and Indiana lump, when it sells, brings $1.75@2.15; run-of-mine, $1.60@1.75 and screenings, $1.50@1.70. Contract sales of these coals are at low figures and some new contracts are made at still lower prices, especially on run-of-mine.

Of coals from east of Indiana smokeless is 15 or 25c. off from circular prices, selling for $3.05@3.30 for lump and $2.75@2.95 for run-of-mine. Hocking is 10 to 25c. off the circular price of $3.15; Pittsburg No. 8 and Youghiogheny have a light open market at $2.65 and $3, respectively, for ¾-in. lump.

The anthracite market is dull and even the approach of the end of June with the less discount for July fails to stir activity.

Cleveland

June 22—Trade is steady, and the demand for steam fuel, chiefly slack, is improving: The quotations for Middle district coal are: Lump, $1.85@2; run-of-mine, $1.65@1.75; slack, $1.25@1.35. For No. 8 district lump, $1.90@$2.05; run-of mine, $1.70@1.80; slack, $1.40, all f.o.b. Cleveland. A circular just issued puts prices of Massillon coal for domestic use at $2 for lump and washed nut; $1.85 for run-of-mine and $1.75 for slack, all f.o.b. mines; these prices to hold until Aug. 31 next.

Indianapolis

The tendency is still toward improvement and the mining conditions have developed satisfactorily during the past week. While the coal prices are not attractive, the future indications seem to promise much. The present prospect for work at the Indiana mines in general is better than it has been for several years. This condition extends over nearly all the State. The Gary Steel Works are contracting for much coal.

Pittsburg

June 22—Coal production continues at a fairly steady gait, and preparations are being made for the general resumption of Lake shipments after July 4. The market is not very active. Nominal prices remain at $1.10 to manufacturers and $1.20 to retail dealers, for mine-run at the mines, these prices being shaded 5 to 10c. Slack is quoted at 60 to 65c. per ton.

Connellsville Coke—The appraisements in connection with the proposed merger of independent operations will be completed this week. A formal announcement of the properties to be included and the identity of the backers is promised for about July 15. It is admitted that some of the high-priced properties may be dropped, but the claim is, nevertheless, made that two-thirds of the independent acreage in the Connellsville field will be merged.

The market shows a slightly firmer tone, some operators having advanced prices, but the market, as a whole, can hardly be quoted more than 5c. a ton higher on furnace coke. Furnace coke, prompt, is $1.55@1.60; contract, $1.65@1.75; foundry, prompt, $1.80@2; contract, $1.90@2.25.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending June 12 at 299,486 tons, an increase of 8000 tons over the previous week; shipments as 4138 cars to Pittsburg, 6213 cars to points west of Pittsburg and 730 cars to points east of Connellsville, a total of 11,081 cars, an increase of 900 cars.

Foreign Coal Trade

German Coal Trade—Imports and exports of fuel in Germany, four months ended April 30, metric tons:

	1908.	1909.	Changes.	
Imports:				
Coal	3,360,489	2,992,131	D.	368,358
Brown coal	2,977,992	2,583,140	D.	394,852
Coke	169,081	207,866	I.	38,785
Briquets	62,693	61,292	D.	1,401
Exports:				
Coal	6,357,242	6,934,991	I.	577,749
Brown coal	7,903	9,562	I.	1,659
Coke	1,196,219	1,099,710	D.	96,509
Briquets	548,701	442,737	D.	105,964

Coke exports this year included 8308 tons to the United States.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on June 12: Best Welsh steam, $4.14; seconds, $3.96; thirds, $3.84; dry coals, $4.08; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.70; second, $2.58. All per long ton, f.o.b. shipping port. There has been a sharp advance, ranging from 12 to 24c. per ton.

Iron Trade Review

New York, June 23—Business in the iron and steel markets continues fairly active, especially when it is considered that the month of July is approaching, when trade is usually slack. Orders continue to come in well—not quite with the rush that was evident in the latter part of May, but still on a fairly good scale; and it is noted that specifications on contracts are coming in regularly and freely. Most of the mills have no complaint to make.

In finished material structural steel continues to lead and the volume of small contracts reaches a large total. Only a few heavy contracts are pending at the present time, but more projects are coming up and others will soon be in a position for tenders. It is noted that the fabricating companies are inclined to ask prices a little higher than they have been accepting. The railroads are still rather backward, although there is now considerable placing of bridge work and some orders for cars. The only heavy orders for rails have come from the Harriman lines. It is said that American makers have secured an order of 50,000 tons of rails for South America.

In pig-iron foundry orders have been inclined chiefly to moderate quantities. A few large contracts both for foundry and basic has been placed for fourth-quarter delivery; most of them at a slight advance on current prices. Furnaces are inclined to be rather firm in their views of prices and to ask advances on all orders for future delivery.

Wage Increases—The Jones & Laughlin Steel Company, of Pittsburg, the Cambria Steel Company and Pennsylvania Steel Company on July 1 will restore wages to the rates prevailing before a 10 per cent. reduction was made last April. The same action will be taken by the Thomas Iron Company, one of the largest merchant-furnace interests, and by several less important companies.

Baltimore

June 22—Exports for the past week included 143,038 lb. zinc dross and 3,787,200 lb. steel billets to Liverpool. Included in imports were 6200 tons manganese ore from Vizigapatam, India.

Birmingham

June 21—Optimism prevails among the pig iron and steel manufacturers. The demand is equal to the output and the inquiries that are coming in are satisfactory. The sales are still in small lots with occasionally a large quantity. The quotations show but little change. No. 2 foundry is being held at $11.50 per ton, delivery during the third quarter at the latest. Iron during the latter part of the year is being quoted at $12 per ton with some tentative orders in hand. The make promises to be kept up. The Birmingham Coal and Iron Company announces that as soon as No. 2 furnace goes out of blast for repairs, No. 1 at Vanderbilt, will be started up.

The appointment of receivers for the Woodstock Iron Company, upon a petition filed in the United States court, in involuntary bankruptcy, during the past week, promises to be temporary. J. M. Barr, president of the company, is one of the receivers and W. E. Leake the other.

Chicago

June 21—The iron market shows no signs of weakening so far as sales or prices of pig iron generally are concerned, and iron and steel products are increasing in demand week by week. Foundry iron

is still selling in small lots, with prices practically unchanged from last week. The demand for Northern iron seems to be increasing somewhat at $16.50, generally quoted and obtained on fourth-quarter business. For Southern iron $11.50, Birmingham ($15.85, Chicago), is standard, with some interests very strong for 25 or 50c. more. Lake Superior charcoal is in good demand at $19.50.

Aside from a few purchases of long-deferred requirements, the market continues to have transactions of only a few hundred tons each. The average consumer is buying, as heretofore, only a short time ahead, but continues also feeling the market with inquiries for good-sized amounts, with the expectation of rushing in quickly should a turn toward higher prices appear. With the heavy consumption of iron and steel that is beginning to appear, this attitude seems destined soon to disappear. That the number of small purchases is large and increasing shows generally diffused improvement in the melter's business.

Railroad supplies and structural material continue to lead the market for iron and steel goods, with other products in good and increasing demand. Coke is somewhat more active and firm at $4.70, Chicago.

Cleveland

June 22—The strike of lake seamen is making less trouble, and all the vessels needed are moving. The longshoremen voted against the proposed sympathetic strike. Ore is moving freely. Some sales are reported.

Pig Iron—A moderate business only has been done, chiefly in small lots, with one or two up to 5000 tons each. Prices are firm around $15.25@15.50 for No. 2 foundry and $15.75 for bessemer pig.

Finished Material—Several contracts for structural steel are reported, including one large one. Bars are quieter, most buyers being supplied for the present. Specifications on contracts are coming in well.

Philadelphia

June 23—The pig-iron market continues strong and sales foot up a pretty large total. Foundry-iron orders are not very large, but there has been considerable business in basic and quite a call for low-grade iron for pipe foundries. Sellers are pretty firm in their views and No. 2X foundry may be quoted at $16.50@16.75; No. 2 plain, 50c. less. Gray forge is more active than it has been, around $15.25. Some Virginia iron is selling, but not much Alabama.

Steel Billets—There is a better demand for small lots but no large sales. Advances are being asked and at least $2 per ton more is wanted than a few weeks ago.

Bars—The market is stronger and mills are asking $1 or $2 more per ton for refined iron, and $1 more on steel bars. Store trade is improving considerably.

Sheets—A big business is being done in small orders for prompt shipment.

Scrap—Sales have not been large, but dealers are not regretting this. They are holding on to their piles, looking for a big profit soon. Heavy steel scrap is being gathered in wherever it can be found.

Pittsburg

June 22—Railroad buying continues to furnish the chief activity in the steel trade. The buying of steel cars by leading roads is on quite a liberal scale, while locomotives and track materials are being taken and rail orders are averaging a large tonnage. The largest single purchases are those of the Harriman lines, about 150,000 tons, while the Argentine order, 49,000 tons, is the best export rail order taken for some time.

While new buying of steel products by manufacturers and jobbers is on a reduced scale, orders and specifications on old contracts are on a liberal scale, and June will probably prove to be the record month of the half year. Specifications have been so liberal that some of the mills have gotten behind, and in extreme cases rolling schedules are being made up 30 days in advance.

Pig Iron—The market has continued to show an advancing tendency, and while prices are not quotably higher on all grades, there is a distinctly firmer tone in every direction, and some sales have been made at higher prices than formerly. Some small lots of foundry iron, for instance, have sold at $15.25, Valley, for early delivery, while the minimum for such delivery is $15, Valley, $15.25 being demanded for delivery over the third quarter or second half, an advance of fully 25c. in the week. While basic might be obtained for early delivery at last week's quotation of $14.75, Valley, the market is generally held to be $15 for extended delivery. Bessemer is firm at $15.25, Valley, and it is doubtful if much iron could be picked up at this price. Forge is quotable at $14.15, Valley.

Steel—The scarcity of open-hearth steel has become more pronounced. Open-hearth billets are quoted at 50c. or $1 above the nominal market of $23, which still prevails on bessemer billets. Open-hearth sheet-bars are also scarce, being quoted at $26, with bessemer at $25. The nominal market is $25.50, delivered, but this price was shaded a few weeks ago to $24 or less. It is understood that these low-priced sales were of bessemer steel only, the sellers not being able to furnish open-hearth bars, and that the present scarcity of open-hearth is due to buying by consumers who must have a proportion of open-hearth, but covered on bessemer only. Plates are not as strong as structural shapes, and 1.25c. is occasionally done on attractive business, the regular market being quotable at 1.30c., the same as on shapes.

Sheets—Demand has improved somewhat, and the market is slightly firmer. Capacity continues to be but indifferently employed, but this is almost a permanent feature of the sheet trade, since even in 1906 and 1907 there was frequently some idle capacity, while several new mills have been built since then, and there are further projects under consideration at the present time. The market can be quoted at 2,20c. for black and 3.20c. for galvanized, but occasionally on attractive business these prices are shaded $1 per ton.

Ferromanganese—The market has shown a slightly firmer tone, although transactions are not large, and is quotable for early delivery at $41, Baltimore, or $42.95, Pittsburg; contracts for next year commanding about $42, Baltimore.

Sault Ste. Marie Canal

The total freight passing through the Sault Ste. Marie canals for the season to June 1 is reported as follows, in short tons:

	1908.	1909.	Changes.
East-bound	1,049,313	3,845,433	I. 2,796,120
West-bound	618,829	1,339,529	I. 720,700
Total	1,668,142	5,184,962	I. 3,516,822

In 1907 the total was 8,922,877 tons. The number of vessel passages this year was 2130, giving an average cargo of 2434 tons. The mineral freights included in the totals were as follows, in short tons except salt, which is in barrels.

	1908.	1909.	Changes.
Coal	453,121	1,096,860	I. 643,739
Iron ore	263,882	3,028,609	I. 2,764,727
Pig and man. iron	50,820	65,000	I. 14,180
Copper	14,264	21,613	I. 7,349
Building stone	.....	450	I. 450
Salt, bbl.	163,534	164,340	I. 806

In 1908 ore traffic did not fairly begin until June. Iron ore formed 58.4 per cent. of the total tonnage this year; coal, 21.2 per cent.

Metal Markets

New York, June 23—The metal markets have shown a tendency to recede rather than to advance; sales have not been so active, and there is less speculative business.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1909..	$11,171,265	$ 2,263,721	Exp. $ 8,907,544
" 1908..	26,555,913	3,101,002	Exp. 23,454,911
Year 1909..	55,487,891	17,767,857	Exp. 37,720,034
" 1908..	44,891,257	22,958,223	Exp. 21,933,034
Silver:			
May 1909..	4,428,448	3,857,388	Exp. 571,060
" 1908..	4,028,334	3,389,568	" 638,766
Year 1909..	23,854,629	18,532,453	" 5,322,176
" 1908..	21,077,185	17,688,150	" 3,389,035

Exports from the port of New York, week ended June 19: Gold, $50,000 to South America; silver, $772,846, chiefly to London and Paris. Imports: Gold, $96,418, from the West Indies and South America; silver, $52,084, from the same countries.

Gold—The price on the open market in London was unchanged at 77s. 9d. per oz. for bars. The gold arriving went chiefly to the Bank of England. In New York exchange rates were high but no gold has been actually shipped to Europe.

Platinum—Business shows the usual summer quiet and prices are unchanged at $22.50@23 per oz. for refined platinum, $25 for hard metal and $18@20 for scrap. The price of iridium has been raised and most dealers anticipate an advance in platinum.

Our special correspondent reports from St. Petersburg, under date of June 10, that sales have been a little better but this has had no influence on prices, which remain unchanged. Platinum is quoted at Ekaterinburg at 4.50@5 rubles per zolotnik for crude metal, 83 per cent.; and at St. Petersburg at 18,000@19,000 rubles per pood. These prices are equivalent to an average of $17.11 and $18.13 per oz. respectively.

Silver—The bullion supplies in the East are large, so we are informed, and there is no lack of silver. At the same time the price remains comparatively steady, while Indian advices as to rain are reported as encouraging for trade and for prices for silver bullion.

SILVER AND STERLING EXCHANGE

June.	17	18	19	21	22	23
New York....	52⅜	52⅛	52⅜	52¼	52⅜	52⅛
London.....	24⅛	24	24⅛	24 1/16	24 1/16	24⅛
Sterling Ex..	4.8785	4.8790	4.8800	4.8805	4.8815	4.8810

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, as reported by Messrs. Pixley & Abell, year to June 10:

	1908.	1909.	Changes.
India.....	£ 3,698,158	£2,311,900	D. £1,386,258
China.....	516,400	1,075,100	I. 558,700
Strait.....	90,510	82,800	D. 7,710
Total.....	£ 4,305,068	£3,469,800	D. £ 835,268

Imports for the week, £205,500 from New York. Exports, £1500 to Egypt and £95,700 to India; £97,200 in all.

Copper, Tin, Lead and Zinc

June.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
17	13⅛ @13⅝	13 @13⅛	58⅜	29⅜	4.35	4.27½ @4.32½	5.27½ @5.32½
18	13⅛ @13⅝	13 @13⅛	58⅛	29⅜	4.35	4.27½ @4.32½	5.27½ @5.32½
19	13⅛ @13⅝	13 @13⅛	....	29⅛	4.35	4.27½ @4.32½	5.27½ @5.32½
21	13⅛ @13⅝	12⅞ @13⅛	58 11/16	29⅛	4.35	4.27½ @4.32½	5.27½ @5.32½
22	13⅛ @13⅝	12⅞ @13⅛	58⅛	29⅛	4.35	4.27½ @4.32½	5.27½ @5.32½
23	13⅛ @13⅝	12⅞ @13⅛	58⅛	29⅛	4.35	4.27½ @4.32½	5.27½ @5.32½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The weakness on the Stock Exchange in the early part of the week June 17-23 had a pronounced influence on the temper of the holders of speculative copper both here and in Europe, and the market became deluged with offerings from these sources at lower prices. When the level for electrolytic had come down to the parity of the standard market, consumers showed more interest and a fair amount of business is reported as having been done in this country and abroad. There was no open market for Lake copper, sellers being disinclined to lower their prices in proportion to the decline in electrolytic, and for that reason such transactions as were reported appear to have been for special purposes.

The market has been very much mixed. The United Metals Selling Company has continued to ask 13⅞c. for Lake and 13¾c. for electrolytic, delivered, 30 days, but is doing no business at those figures, and is maintaining former asking prices simply because it has no present wish to meet the market. Calumet & Hecla is also understood to be temporarily out of the market. On the other hand the majority of the large selling agencies have been taking, at the declining prices, such business as has been offered, and certain first hands have manifested some pressure to sell. A good deal of speculative copper has been offered by second hands and some transactions have been made by them at prices below those which represent the bulk of the business, sales netting as low as 12¾c. having been made. The market for Lake has held up better than for electrolytic, because there is but little of this grade that is pressed for sale, and some consumers who have been obliged to buy have paid as high as 13⅝c. for relatively small quantities. Sentiment as to the market in the immediate future is mixed. There remains some of the optimism of a little while ago, which is expressed in the idea that there will be a rally from present prices, especially if the London market takes a turn upward. In other quarters ideas are pessimistic in view of the continued large production. The market closes at 13⅜@13⅝c., nominally, for Lake, and 12⅞@13⅛c. for electrolytic. The average of the week for casting copper has been 12¾@13 cents.

Copper sheets are 17c. base for large lots. Full extras are charged, and higher prices for smaller quantities. Copper wire is 15c. base, carload lots at mill.

Some new prices on brass products were put in effect June 21. The base price on high brass sheets is now 14½c.; on high brass wire, 14¾c., and on high brass rods, 14¾c. per lb. The base price on brazed brass tubing remains 20⅜c. per pound.

The London market on Thursday and Friday bordered on demoralization, spot at one time reaching £58 and three months, £58 15s. Supporting orders as well as bear covering stayed the decline. The close is higher and the tendency better at £58 12s. 6d. for spot and £59 10s. for three months.

For refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £61 10s.@£62 10s.; strong sheets, £73 10s. @ £75 10s.

Exports of copper from New York and Philadelphia for the week were 7857 long tons. Our special correspondent gives the exports from Baltimore at 1215 tons copper.

Tin—In sympathy with copper, tin has shown a declining tendency in London. Shipments from the Straits are reported as being larger than anticipated, while consumption in the United States leaves much to be desired. The close is cabled at £133 for spot and £134 10s. for three months.

In the domestic market, consumers are holding off and cannot even be tempted by offers below the import basis, at which some dealers are trying to dispose of spot material. The market at the close is quoted at about 29¼ cents.

Lead—Business has been quiet and prices are unchanged at 4.27½@4.32½ St. Louis, and 4.35, New York, for ordinary brands. Chemical lead has sold at St. Louis at 4.35 during the week.

The London market is neglected, the close again being a trifle lower at £13 for Spanish, and £13 2s. 6d. for English.

Spelter—The Senate on June 16 adopted the zinc ore schedule proposed by the Finance Committee, which provides for 1c. duty on the full zinc contents of all ores containing over 25 per cent. Lower duties are assessed on ore containing less than 25 per cent. which, however, means nothing to the smelters as they cannot treat ores for the purpose of making spelter containing less than 30 per cent. zinc, and besides the high freight charges make it impossible to import lower grades at a price which would permit of profitable mining.

The spelter market has shown persistent strength and while the extreme activity has subsided now that the worst is known, there is an inflow of orders and the close is firm and higher at 5.42½@5.47½c. New York, 5.27½@5.32½c. St. Louis.

New York quotations for spelter were 5.42½@5.47½c. for June 17 to 23, inclusive.

The London market is a shade lower in sympathy with the other metals there, the close being cabled at £21 17s. 6d. for good ordinaries, and £22 2s. 6d. for specials.

Base price of sheet zinc is 7c. per lb., f.o.b. La Salle-Peru, less 8 per cent. discount.

Other Metals

Antimony—The market continues dull with only small sales. Prices are nominally unchanged at 8⅛c. for Cookson's, 7⅞c. for U. S.; 7⅜@7⅝c. for outside brands. Some sales are made subject to tariff should a tax be imposed.

Aluminum—No. 1 ingots are quoted 22 @24c. base; wire, 31@32c. base; sheets 33@34c. base. Business is rather quiet.

Quicksilver—There has been a slight improvement in business, but no change in prices. New York quotation is $44.50 per flask of 75 lb. San Francisco, $44 for domestic and $42 for export. London price is £8 7s. 6d. per flask, but jobbers continue to offer at 5s. less.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations 75c. per lb., in 100-lb. lots, at Cleveland, Ohio. In Germany, 450@475 marks per 100 kg. at factory.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, five months ended May 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.
Copper, long tons	54,128	27,984	Imp. 26,144
Copper, 1908	64,936	27,400	Imp. 37,536
Tin, long tons	15,846	17,193	Exp. 1,347
Tin, 1908	18,624	17,368	Imp. 1,256
Lead, long tons	91,615	19,430	Imp. 72,185
Lead, 1908	99,198	23,488	Imp. 75,710
Spelter, l'g. tons	45,279	2,713	Imp. 42,566
Spelter, 1908	44,808	8,262	Imp. 36,546
Quicksilver, lb.	1,717,168	418,982	Imp. 1,298,186
Quicksilver, '08	2,129,327	754,965	Imp. 1,374,362
Ores:			
Tin ore and con.	9,686	.....	Imp. 9,686
Tin ore, 1908	10,527	.....	Imp. 10,527
Pyrites	328,597	.....	Imp. 328,597
Pyrites, 1908	366,162	.....	Imp. 366,162

Copper totals include metallic contents of ore and matte. Exports include reexports of foreign material. Of the imports in 1909 the United States furnished 128 tons copper matte, 14,203 tons fine copper and 15,086 tons lead. The lead was chiefly Mexican, refined in this country.

British Iron Trade—Exports and imports of iron and steel and of machinery in Great Britain, five months ended May 31, as valued by Board of Trade returns:

	Exports.	Imports.	Excess.
Iron and steel	£15,227,591	£ 3,090,849	Ex. £12,136,742
Machinery	11,595,901	2,000,790	Ex. 9,595,111
New ships	2,799,964	.....	Ex. 2,799,964
Total	£28,623,456	£ 5,091,639	Ex. £23,531,817
Total, 1908	33,601,827	5,377,208	Ex. 28,224,619

Decrease in exports, £4,978,371, or 14.8 per cent.; decrease in imports, £285,569, or 5.3 per cent. The quantities of iron and steel of all kinds were, in long tons:

	1908.	1909.	Changes.
Exports	1,741,392	1,651,440	D. 89,952
Imports	420,887	460,792	I. 39,905

The increase in quantities imported was mainly in billets, blooms and other half-finished material.

Iron Ore Imports—Imports of iron ore into Great Britain for the five months ended May 31 were 2,402,147 long tons in 1908, and 2,345,119 in 1909; decrease, 57,028 tons. Of the imports this year 1,800,246 tons were from Spain.

Zinc and Lead Ore Markets

Joplin, Mo. June 19—The highest price paid for zinc was $47 per ton, the base offerings for heads of sulphide ore ranging from $43 to $45 per ton of 60 per cent. zinc; slimes sold as low as a base of $40; silicate prices ranged from $16 to $23; the average price, all grades, was $40.68 per ton. The highest price paid for lead was $60, medium grades commanding from $57 @59.50. The average price, all grades, was $58.04 per ton.

Only one bin of zinc ore was known to have sold on a base price of $45; the bins of the producers in the north part of Webb City, who are holding for a $45 base were passed by the purchasing agents, for some who were not demanding so high a figure.

Several large bins of zinc ore were purchased on a base of $44.50, the smelters curtailing their purchases to 550 tons less than the previous week.

Platteville, Wis., June 19—The highest price paid this week for zinc ore was $45; the base price of 60 per cent. zinc was $44 per ton. The top price paid for lead ore was $59 the base price, 80 per cent., was $57@58 per ton.

SHIPMENTS, WEEK ENDED JUNE 19.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Strawbridge	640,000	.....	.....
Benton	434,340	.....	.....
Platteville	428,490	.....	151,200
Hazel Green	412,400	77,700	.....
Cuba City	388,445	.....	79,000
Livingston	160,000	.....	.....
Harker	64,580	.....	.....
Linden	53,370	.....	.....
Total	2,581,625	77,700	230,200
Year to June 19	54,794,055	2,393,480	4,621,400

In addition to the above there was shipped to the American Zinc Ore Separating Company, 1,150,770 lb. and to the Joplin Separator Works, 66,000 lb. zinc concentrates.

SHIPMENTS, WEEK ENDED JUNE 19.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,235,810	872,810	$ 93,481
Joplin	2,089,910	334,190	55,752
Galena	684,320	57,770	16,017
Duenweg	586,320	104,710	15,371
Prosperity	379,310	132,040	11,827
Miami	333,870	136,680	9,638
Carthage	425,360	.....	9,357
Aurora	567,800	.....	9,149
Alba-Neck	390,220	12,970	8,960
Spurgeon	271,040	117,940	7,942
Badger	325,630	4,420	7,127
Granby	514,790	10,000	7,006
Carl Junction	90,530	.....	2,036
Oronogo	110,580	2,120	2,027
Stott City	63,000	.....	1,323
Sarcoxie	53,460	.....	1,123
Quapaw	55,240	.....	1,104
Totals	10,177,190	1,785,650	$259,240
25 weeks	281,351,060	45,610,810	$6,386,336

Zinc value, the week, $207,078; 25 weeks, $5,163,207
Lead value, the week, 52,162; 25 weeks, 1,223,129

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	.....	32.07	.....	60.48	.....
July	34.55	.....	31.67	.....	59.90	.....
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, June 23—Business is improving a little both on spot and contract deliveries and dealers are looking forward rather hopefully to the fall trade. In a few lines, however, trade is backward.

Copper Sulphate—The market has been rather quiet and prices have been shaded a little. Current quotations are $4.22½ per 100 lb. for carload orders and $4.32½ @4.35 per 100 lb. for smaller parcels.

Nitrate of Soda—A good business continues to be done in this article at current prices which are unchanged at 4.15c. for spot and 4.12½c. for futures.

Arsenic—The market is rather quiet, with few sales, and prices quoted are 2¾ @3c. per lb. for white arsenic.

Mining Stocks

New York, June 23—The feature of the general stock market this week has been a marked reaction which carried down prices of a number of stocks. Steel Corporation issues receded, although the loss was not as marked as in some other stocks. Business was active and many shares changed hands.

On the Curb the copper stocks showed more or less weakness, with one or two exceptions. Nevada Consolidated was strong and reached its highest price at a little above $24, notwithstanding the break in other shares. The dealings in this stock were large. Nevada gold stocks sold well and seem to be attracting more attention than they have been, which is rather unusual for a hot-weather week.

The Cobalt stocks are gaining both in prices and in the volume of dealings.

Boston, June 22—There has been a gradual weakening in copper-mining share prices due to the lack of public interest. The market is almost entirely professional. The declines have been general and not confined to any particular class of stocks. No unfavorable mining developments are heard.

Amalgamated has broken almost $7 during the week to $77.75 with no recovery. The movement is entirely professional and is the result of the general decline in the New York.

One thing in favor of copper-mining shares is that they have had no prolonged upward movements, so that the decline cannot go very far. A buying movement in Nevada Consolidated for New York account caused a $1.50 advance to $24.12½. Shannon rights are off to 10c., but there has been a large business in them.

Gossip of the week tells of an amalgamation of the Boston Consolidated and the Utah Copper Company on a basis of 2½ shares of the former for one of the latter. Application has been made to list the new Arcadian Copper Company's stock on the Exchange as 76,000 shares of the old company have been exchanged for the new stock. In Mexico Consolidated affairs a former director is said to have sold some 15,000 shares in the market recently and put a part of the proceeds into Davis Daiy. The Alvarado silver mines will soon be floated by an issue of 200,000 shares of treasury stock.

STOCK QUOTATIONS

NEW YORK June 23	
Name of Comp.	Clg.
Alaska Mine	.15
Amalgamated	78⅜
Anaconda	47½
Balaklala	‡2½
British Col. Cop	7⅛
Buffalo Mines	3½
Butte Coalition	24⅝
Colonial Silver	.30
Cum. Ely Mining	8
Davis-Daly	5 7/16
Dominion Cop.	7
Douglas Copper	3⅛
El Rayo	2
Florence	3¼
Foster Cobalt	.32
Furnace Creek	.10
Giroux	7½
Gold Hill	⅛
Goldfield Con.	7 9/16
Granby	103
Greene Gold	½
Greene G. & S.	9
Guanajuato	1⅛
Guggen. Exp.	196
Hanapah	.15
Kerr Lake	7⅞
McKinley Dar.	.93
Miami Copper	15⅞
Micmac	⅛
Mines Co. of Am.	⅛
Montezu. of C. R.	34
Mont. Sho. C.	1⅛
Nev. Utah M. & S.	2
Newhouse M. & S.	1⅜
Nipissing Mines	10½
Old Hundred	½
Silver Queen	.35
Stewart	⅝
Tennessee Cop'r.	37⅜
Tri-Bullion	⅛
Union Copper	⅛
Utah Apex	6⅛
Utah Copper	49
Yukon Gold	4⅛

†Ex. Rights.

BOSTON June 23	
Name of Comp.	Clg.
Adventure	7⅝
Alloucz	‡40½
Am. Zinc	27½
Arcadian	4⅝
Arizona Com.	39½
Atlantic	9⅛
Boston Con.	14¾
Calumet & Ariz.	102
Calumet & Hecla	650
Centennial	31
Copper Range	79⅞
Daly-West	‡8
East Butte	12
Franklin	16½
Greene—Can.	10
Hancock	11
Isle Royal	25½
Keweenaw	4⅝
La Salle	13
Mass.	8⅜
Michigan	10
Mohawk	65
Nevada	23¼
North Butte	56
Ojibway	10⅜
Old Colony	‡.60
Old Dominion	51⅞
Osceola	135
Parrot	30
Quincy	‡8
Rhode Island	14⅜
Shannon	15½
Superior	41½
Superior & Bost.	14½
Superior & Pitts.	13⅞
Tamarack	70
Trinity	10¼
U. S. Smg. & Ref	48⅝
U.S. Sm. & Re., pd.	49¼
Utah Con.	42½
Victoria	4⅛
Winona	‡5½
Wolverine	148
Wyandotte	2¾

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	42
Am. Smelt. & Ref.	88¾
Am.Sm. & Ref., pf	109
Colo. Fuel & Iron.	41¼
Federal M. & S., pf.	‡88¾
National Lead	83
National Lead, pf.	107
Pittsburg Coal	11¼
Republic I. & S.	29⅞
Republic I. & S., pf.	103½
Sloss-Sheffield	81
Standard Oil	685
U. S. Steel	65
U. S. Steel, pf.	122¾
Va. Car. Chem.	54

BOSTON CURB	Low.
Ahmeek	160
Black Mt.	1
Chemung	17
Corbin	‡8
Globe Con.	4
Helvetia	5⅛
Ray Central	3
Ray Con.	‡17⅛
San Antonio	10¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS June 19		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.08	05
Center Cr'k	2 00	1 50
Cent. C. & C.	83 00	80 00
C. C. & C. pf.	82 00	80 00
Cent. Oil	110 00	100 00
Columbia	8 00	5 00
Con. Coal	20 00	19 00
Doe Run	110 00	100 00
Gra. Bimet.	.22½	.22½
St. Joe	12 00	11 00

LONDON June 23	
Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton'sInd.	0 3 1½
Camp Bird	1 8 6
Esperanza	2 15 7½
Tomboy	1 2 6
El Oro	1 6 3
Oroville	0 13 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. June 23.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.38
Best & Belcher	36
Caledonia	22
Challar	.19
Comstock	30
Con. Cal. & Va.	.78
Crown Point	.40
Exchequer	.28
Gould & Curry	.18
Hale & Norcross	.22
Mexican	.9
Ophir	1.52½
Overman	.23
Potosi	.20
Savage	.21
Sierra Nevada	.27
Union	.47
Utah	.04
Yellow Jacket	.48
TONOPAH STOCKS	
Belmont	89
Extension	48
Golden Anchor	51
Jim Butler	09
MacNamara	25
Midway	.22
Montana	60
North Star	.02
Tono'h Mine of N.	7 12½
West End Con.	23
GOLDFI'D STOCKS	
Adams	01
Atlanta	14
Blue Bell	03
Booth	.13
Columbia Mt.	.10
Comb. Frac.	.54
Con. Red Top	‡ 57
Cracker Jack	02
Dia'dfield B. B. C.	03
Goldfield Belmont	04
Goldfield Daisy	27
Great Bend	06
Jumbo Extension	12
Kendall	03
Lone Star	.04
May Queen	.04
Oro	.06
Red Hill	06½
Roanoke	‡ 08
Sandstorm	09

Name of Co ou	Clg.
Silver Pick	.12
St. Ives	10
Triangle	01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King.	.01
Mont. Shoshone C.	1 50
Tramp Cons.	.05
MISCELLANEOUS	
Greenwa'r Copper	.06
Nevada Hills	.87½
Nevada Smelting	1.00
Nevada Wonder	.50
Nevada-Utah	1.93¾
Penn-Wyoming	...
Pittsburgh S. Pk.	.48
Ray Central	2.87½
Round Mt. Sphinx	.10

COLO. SPRINGS June 18	
Name of Comp.	Clg.
Acacia	.06⅞
C. C. Con.	.03½
Dante	.05¾
Doctor	.08½
Elkton	.64⅛
El Paso	.51
Findlay	‡.12
Gold Dollar	.10½
Gold Sovereign	.03½
Isabella	.22
Jack Pot	.06⅝
Jennie Sample	.07¼
Jerry Johnson	.06¼
Lexington	.04
Mary McKinney	‡ 39¼
Pharmacist	.02¾
Portland	.88
Un. Gold Mines	.05¾
Vindicator	.60
Work	.06¼

Assessments

Company.	Delinq.	Sale.	Amt.
Black Jack, Utah	June 15	July 8	$0.01
Bullion, Nev	June 14	July 13	0.05
Challenge Con., Nev	June 22	July 13	0.05
Chollar, Nev	June 8	June 30	0.10
Con. Imperial, Nev.	May 26	June 17	0.01
Gould & Curry, Nev.	June 8	June 26	0.10
Julia Con., Nev.	May 24	June 17	0.03
Mexican, Nev.	June 28	July 14	0.10
Mountain Dell, Utah	July 19	Aug. 5	0.01½
N. Y. Bonanza, Utah	July 10	July 31	0.03
Palmyra G. & C., Utah	June 11	June 30	0.001
Paymaster, Utah	June 12	June 30	0.00½
Potosi, Nev.	July 9	Aug. 2	0.10
Progressive, Utah	June 23	July 14	0.01
Scorpion, Nev.	June 14	July 6	0.02
Scottish Chief, Utah	July 7	Aug. 4	0.01
Seg. Belcher, Nev	July 7	July 29	0.03
Seven Troughs Mon., Nev.	June 23	July 10	0.00½
Silver King Con., Utah	July 6	July 17	0.10
Union Con., Nev	June 28	July 19	0.10
Yellow Jacket, Nev	July 13	Aug. 5	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	.....	24.760	.....
July	53.115	.....	24.514	.....
August	51.683	.....	23.858	.....
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Year	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13 893	13.901	14 280	62 386	57.688
February	12.905	12 949	13.098	13.295	58.786	61.198
March	12.704	12 387	12.875	12 826	58.761	56.231
April	12.743	12 56¼	12.928	12.93⅜	58.331	57.363
May	12.598	12.893	12.788	13.238	57 387	59.338
June	12.675	.....	12.877	.....	57 842	.....
July	12.702	.....	12.933	.....	57.989	.....
August	13.462	.....	13 639	.....	60.500	.....
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.646	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28 060	July	29.207	.....
February	28.978	28 290	August	29.942	.....
March	30.577	28.727	September	28.815	.....
April	31.702	29.445	October	29.444	.....
May	30.015	29.225	November	30 348	.....
June	28.024	.....	December	29.154	.....
			Av. Year.	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4 025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4 168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	.....	.....	12.600	.....
July	4.744	.....	.....	13 000	.....
August	4.580	.....	.....	13.375	.....
September	4.515	.....	.....	13.125	.....
October	4.351	.....	.....	13.375	.....
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13.156	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	.....	4.393	.....	19.000	.....
July	4.485	.....	4.338	.....	19.031	.....
August	4.702	.....	4.556	.....	19.350	.....
September	4.769	.....	4.619	.....	19.563	.....
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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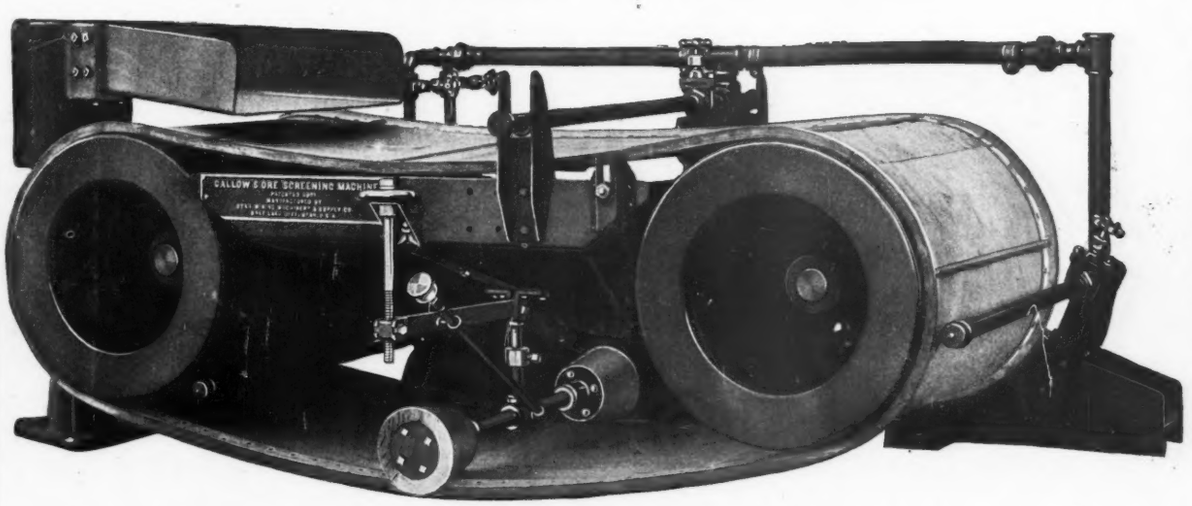
THE ENGINEERING AND MINING JOURNAL

Vol. 87. 505 Pearl Street, New York. No. 26.

Contents, 1291. Index to Advertisers, 40. Buyers' Directory, 42. Professional Directory, 62.

WHO SAID CAPACITY?

Callow Screen



The following figures have been furnished us by individual users, whose names we are prepared to give to those sufficiently interested to ask for them.

Utah Lead Ore	Screening to	16	mesh	325	tons per	24	hours	per	Duplex	Machine		
Utah Lead Ore	" "	30	"	250	" "	"	"	"	"	"		
Coeur d'Alene Ore	" "	40	"	150	" "	"	"	"	"	"		
Mexico Quartz Ore	" "	60	"	150	" "	"	"	"	"	"		
Montana Copper Ore	" "	60	"	108	" "	"	"	"	"	"		
Coeur d'Alene Ore	" "	80	"	100	" "	"	"	"	"	"		
Coeur d'Alene Ore	" "	100	"	50	" "	"	"	"	"	"		
Montana Copper Ore	" "	150	"	50	" "	"	"	"	"	"		

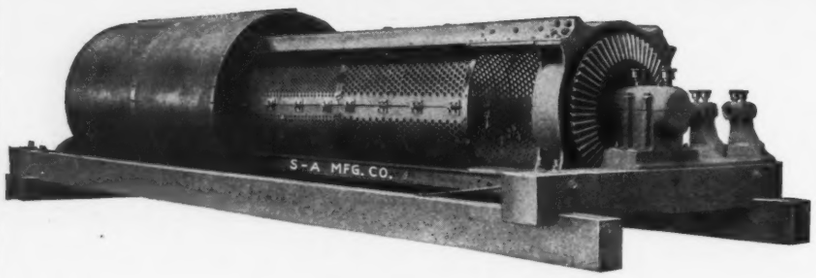
We know of no shaking, vibrating, revolving, conical, or any other kind of screen, from which results approaching the above can be obtained.

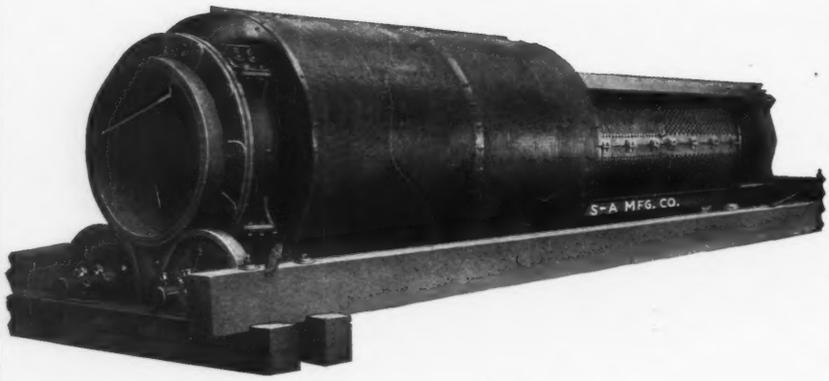
The Utah Mining Machinery & Supply Company

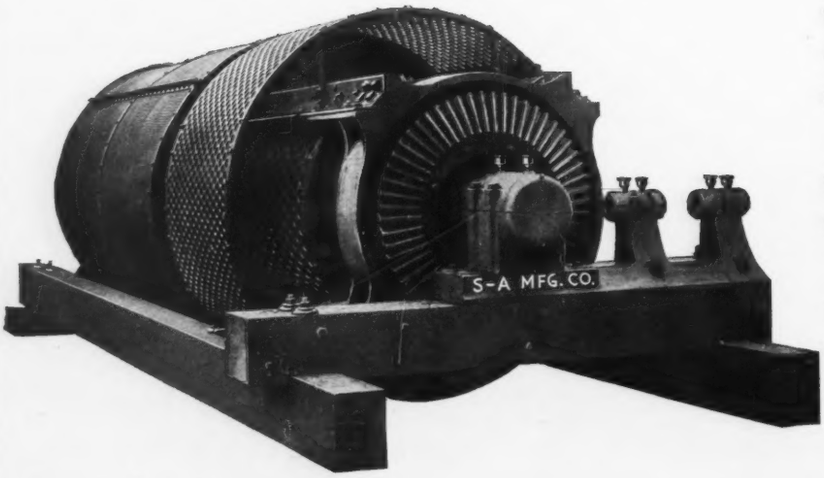
J. E. GALIGHER, Manager

Salt Lake City, Utah, U. S. A.

Stephens-Adamson Mfg. Co.







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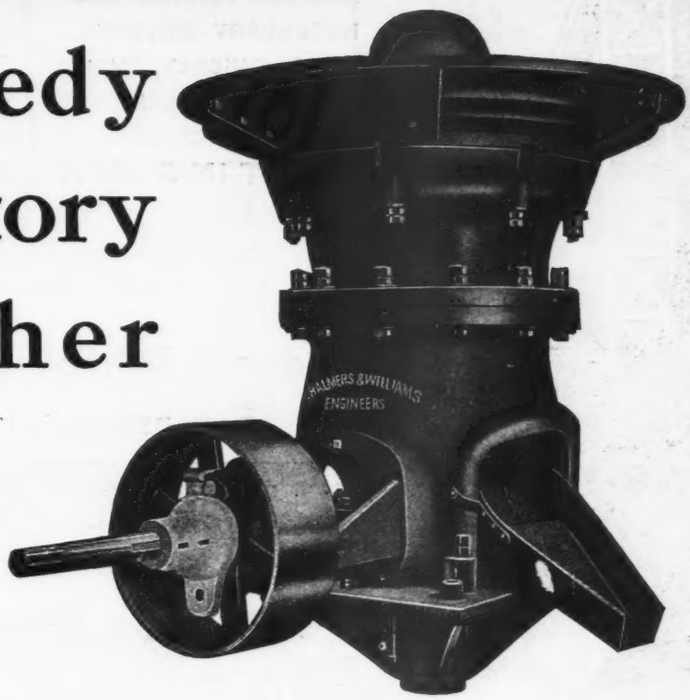
CHALMERS-WILLIAMS

Kennedy Gyratory Crusher



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This crusher represents the latest developments of the gyratory crusher.
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NO OTHER CRUSHER has two dust collars with rings of packing, which make it dust proof, and do away with all temporary means of keeping dust from the eccentric.
NO OTHER CRUSHER has a hopper encircling the top of the shell of the crusher, making it unnecessary to detach it when removing the concaves.

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Southern Agents, W. E. Austin Co., Atlanta, Ga.

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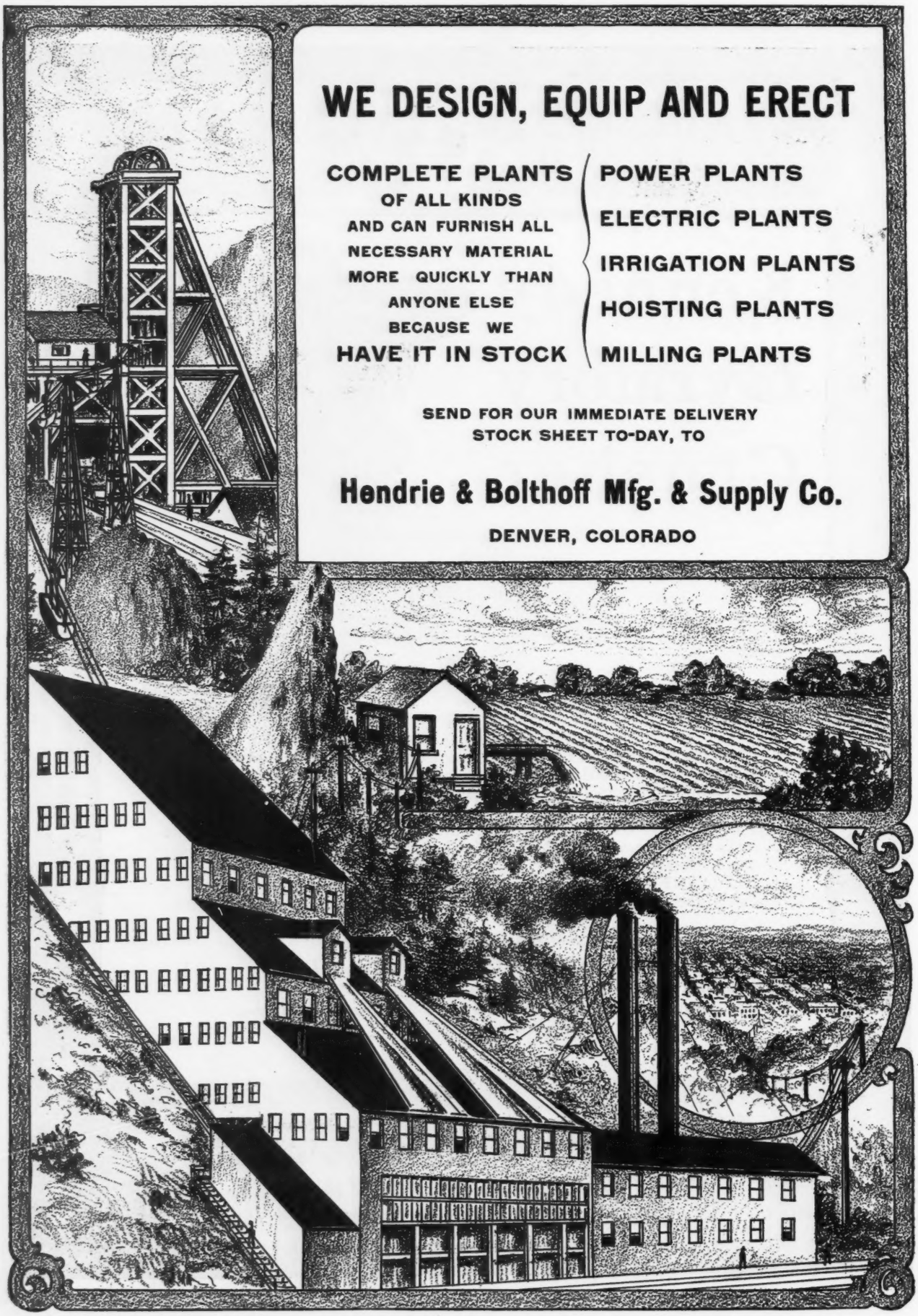
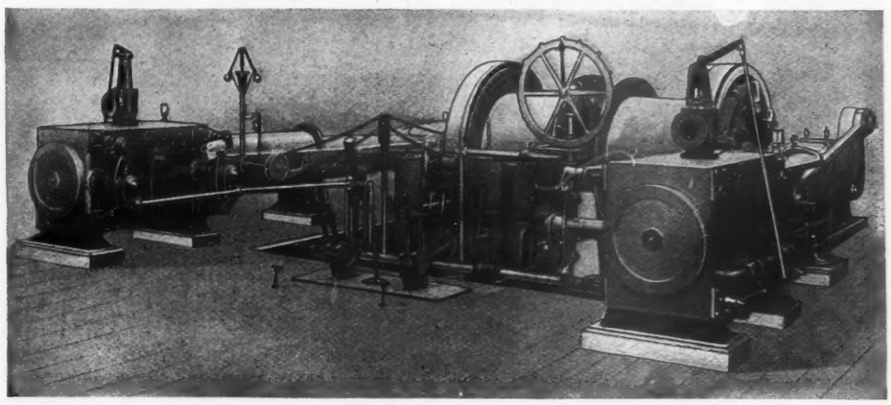


THE WELLMAN-SEAVER-MORGAN CO.

WELLMAN-SEAVER-MORGAN ENGINEERING DIVISION — ENGINEERS AND MANUFACTURERS — WEBSTER, CAMP & LANE DIVISION

Direct Acting Hoisting Engines



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Our Non-Detaching Corliss Valve Gear

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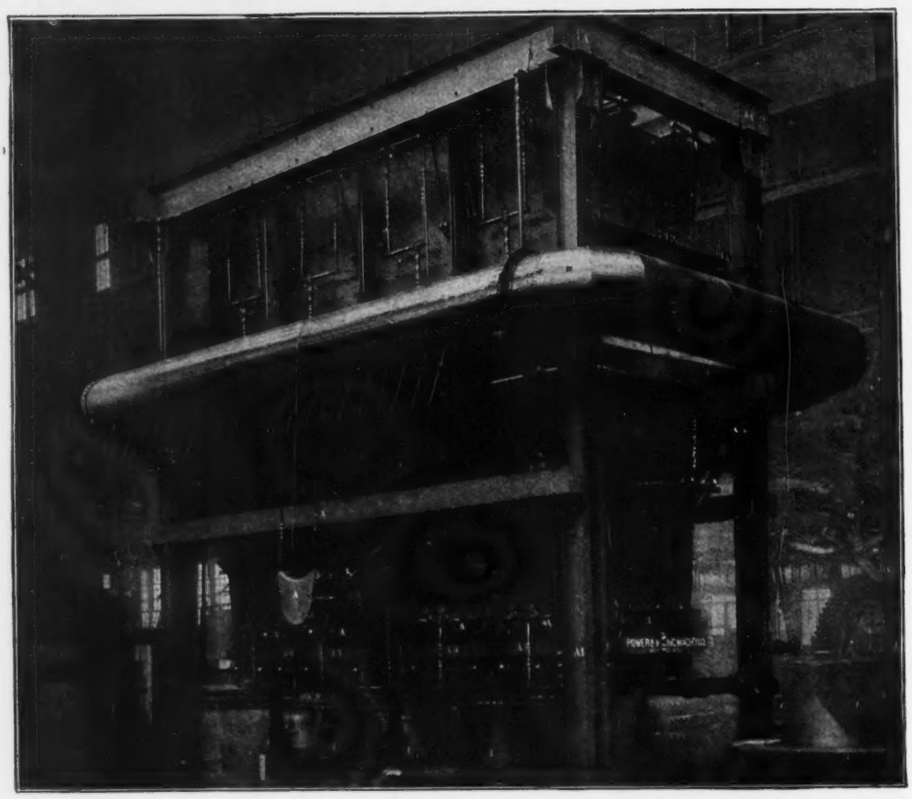

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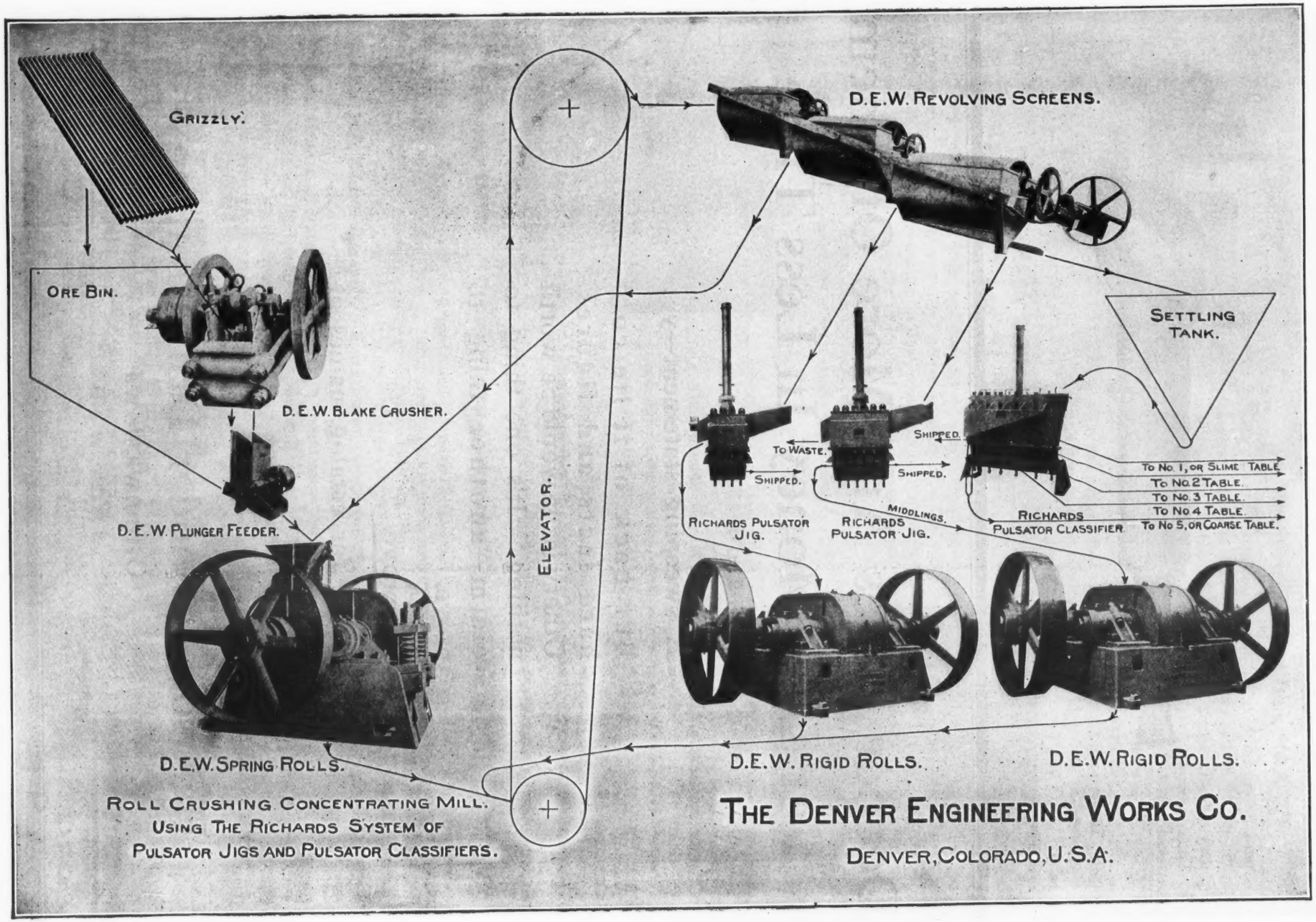

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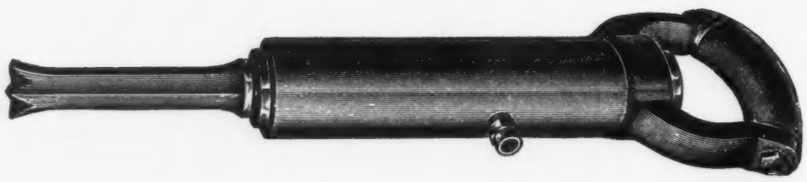

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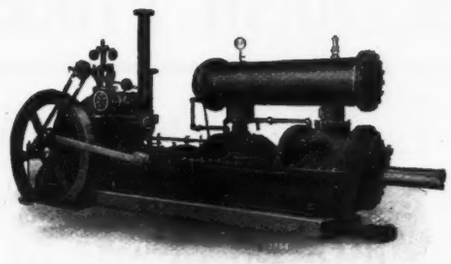

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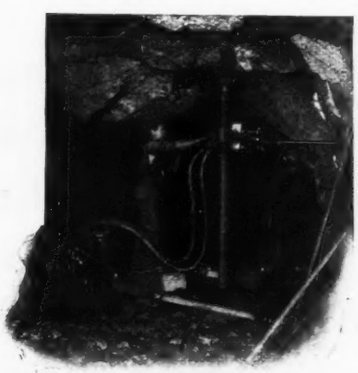
The "AA-2" is a new straight line compressor, following the general lines of the Company's standard "A" type, but modified and developed for the best results possible with compound compression, combined with the compactness and simplicity of the plainest straight line type. "Hurricane-Inlet" and "Cushioned Direct Lift" Discharge valves, balanced adjustable cut-off steam valves, very large air passages and an unusually generous intercooler are some of the distinctive features of this up-to-date high-duty compressor.

Rock Drills
"Sergeant" and "Little Giant"

These two standard drills continue to hold the foremost place on grounds of drilling capacity, power economy, and a tremendous endurance resulting in low repair costs. Probably more of them are in use today than of all other makes combined. Representing, as they do, the best knowledge of the oldest and largest drill builders in the world, they command the full confidence of the mining trade and enjoy a steadily increasing demand.



"Electric-Air" Rock Drills

The Company offers to the mining trade, in these machines, the only thoroughly practical and successful means of drilling rock by electric power. The heavy blow, large capacity, wide stroke variation, simplicity and endurance of the standard rock drill are combined, in the "Electric-Air" Drill, with a power economy reducing the operating cost 50 to 70 per cent. More than four hundred of these machines are in successful use all over the world, proving their practical character.

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The Ingersoll "Crown" and the Rand "Imperial" Hammer Drills represent the experience of thirty-eight years of rock drill building applied to hammer drill construction. They are "standard" machines, in the same class with the Company's "Sergeant" and "Little Giant" rock drills. Every known improvement is embodied in them, resulting in a capacity and endurance far beyond those of all other hammer drills. A recent order for 100 of these drills for the Anaconda Copper Mining Co. demonstrates their recognition by the mining trade as the best in the field. They are described in Pamphlet 4010.

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E140

The Moore Slime Displacement Process

ON and AFTER September 1st, 1909, the nominal royalty rate at which we are issuing licenses prior to that date, will be advanced to the minimum rate of 25 cents per ton, (excepting only to those who have recognized our rights by agreeing to our terms).

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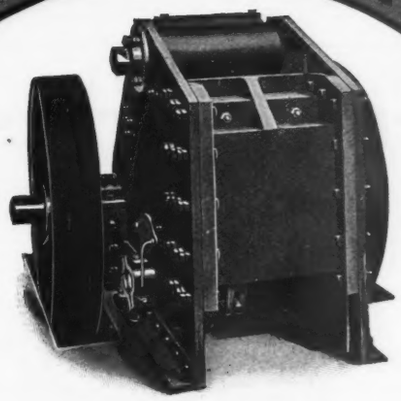

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June 26 Littleton, Colo., U. S. A. 1909

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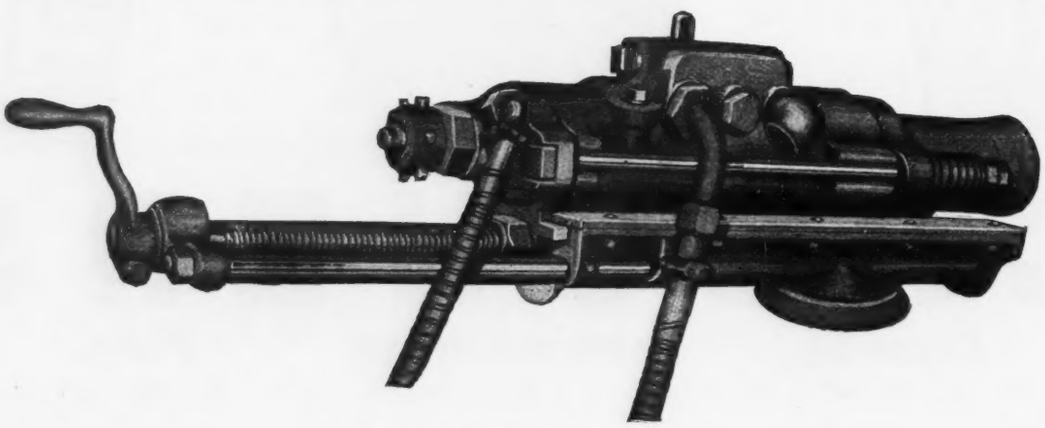

No. 7 (Model Six) Water Leyner Drill.

One of the largest gold mines in Colorado, which has adopted the above drill for its general development work, finds that it has thereby reduced the cost 26% and increased the amount of work done by 50%.

This drill, equipped for 24" changes of steel, only weighs about 110 lbs.; nevertheless it *is doing* in a large number of mines more work by 10% to 50% than 3⅛" and 3¼" piston drills, weighing twice as much, requiring two men, and consuming twice as much air.

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These drills have yet to record their first failure.

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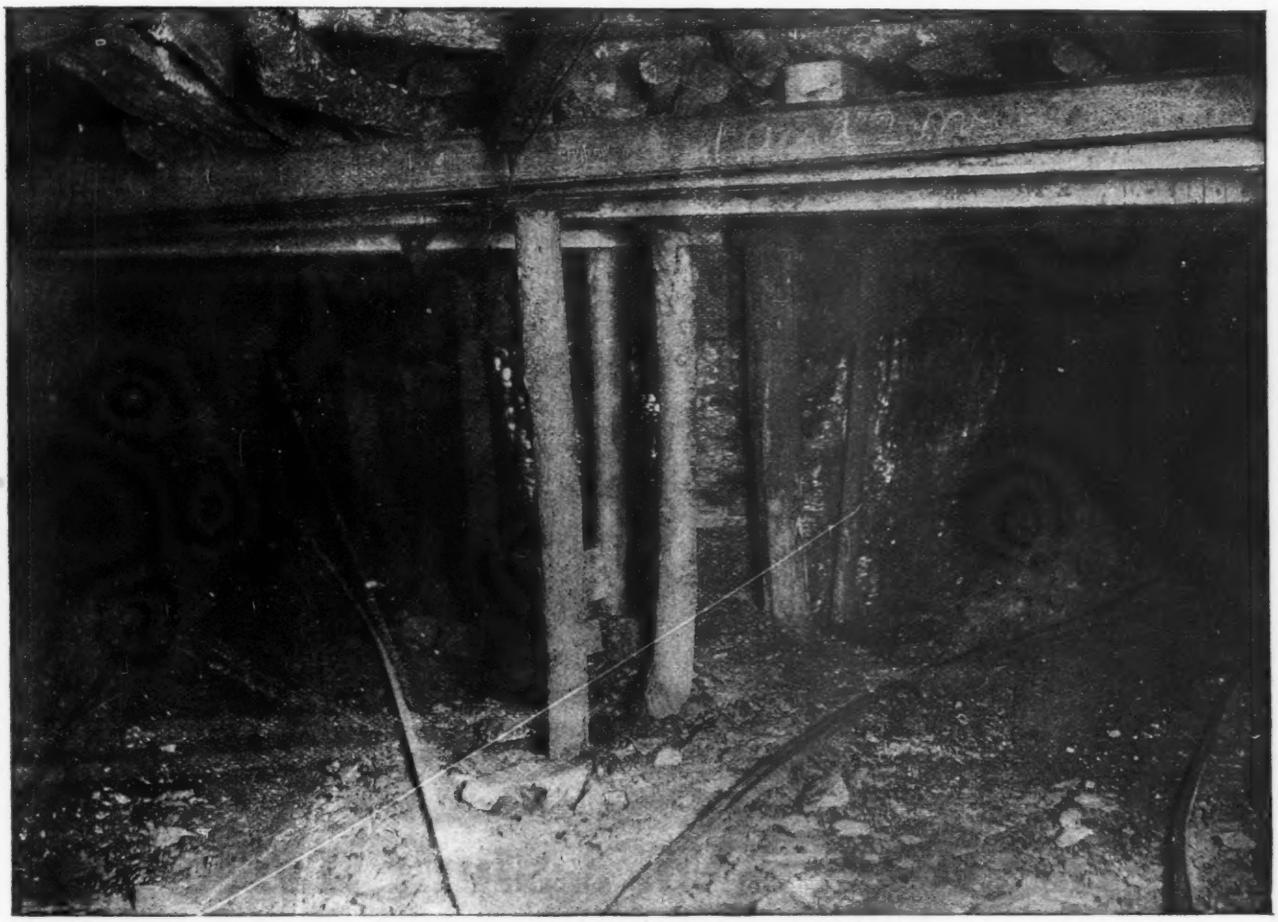

The photograph shows 6" beams used in the Florence Mine of the Youghiogheny & Ohio Coal Company at Martins Ferry, Ohio. They commend themselves for mine timbering purposes by the ease with which they can be obtained and the possibility of great strength with the least reduction in head room.

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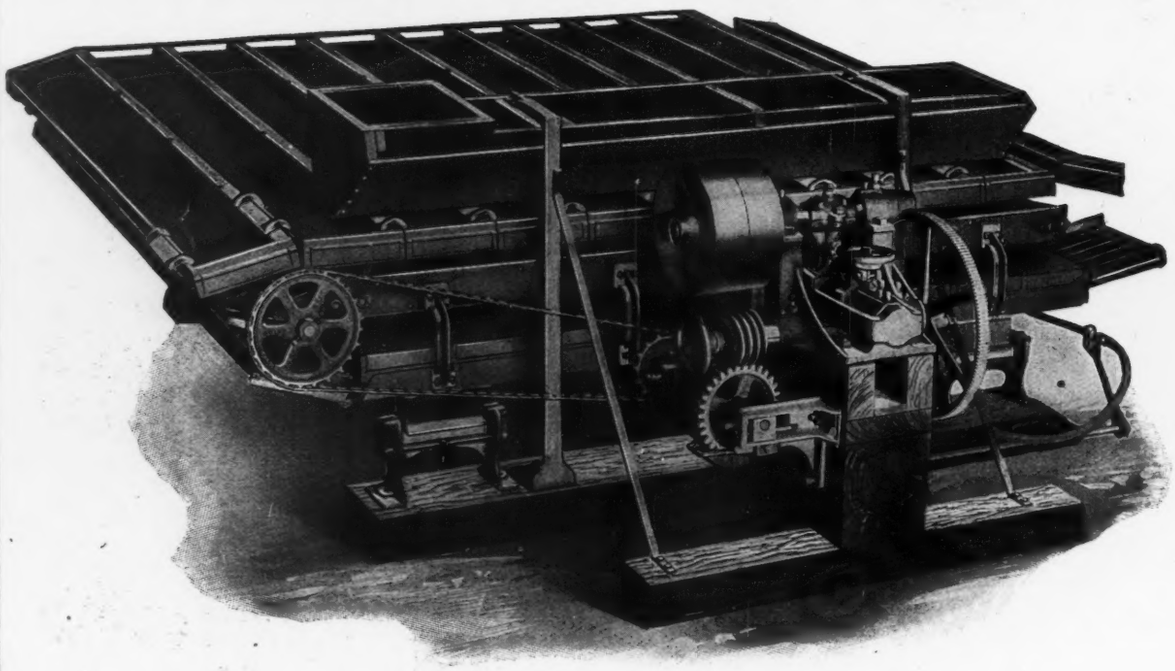

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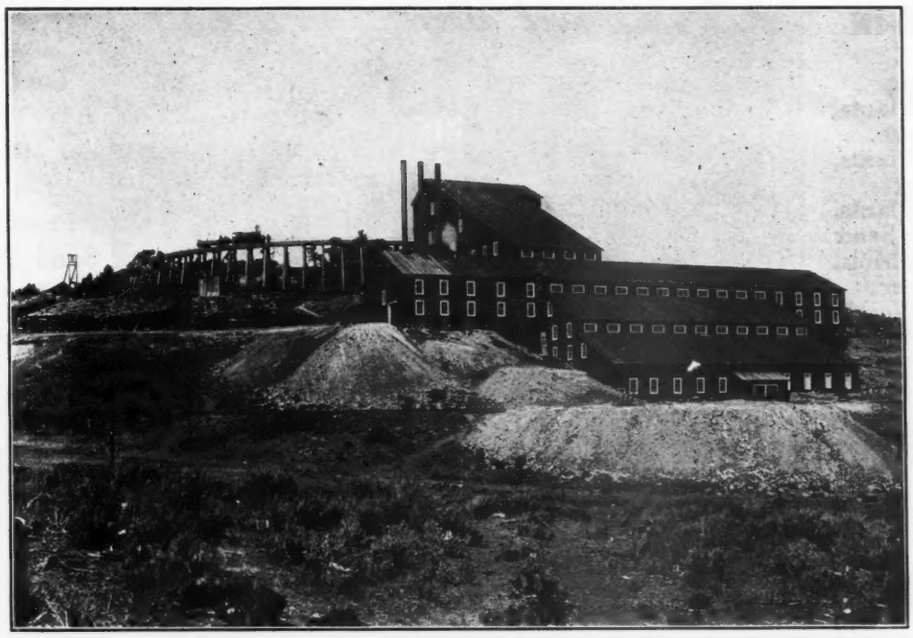

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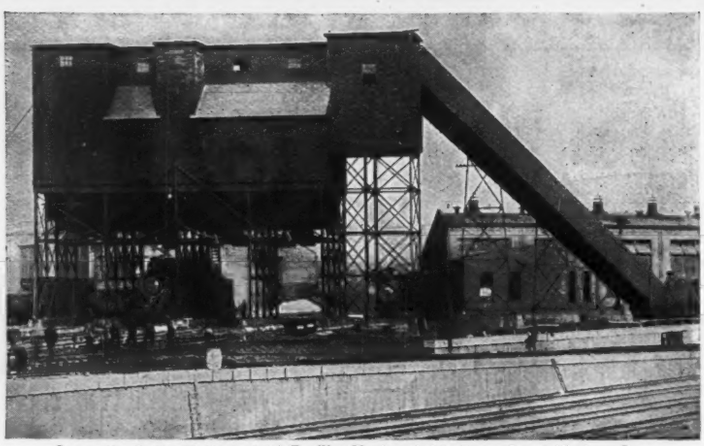

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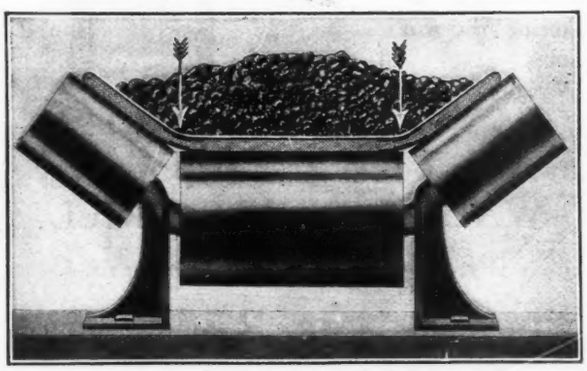

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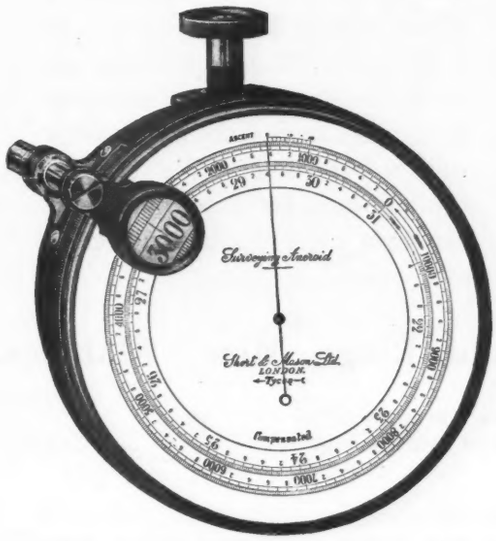

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Black vein, tailings - -	3.51	92.85%
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This is a Sulphide ore with coarse and free panning gold.

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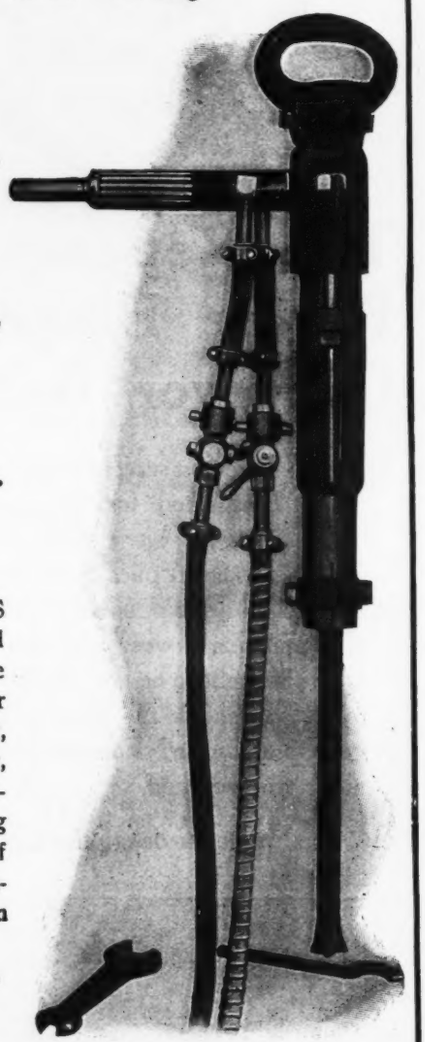

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DOUBLE HAMMER DRILLING
BY USING THE
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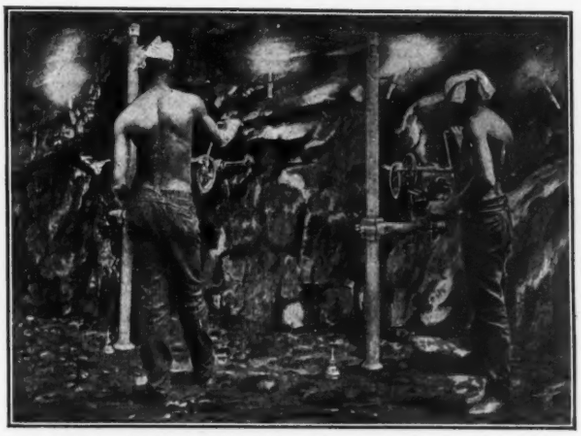

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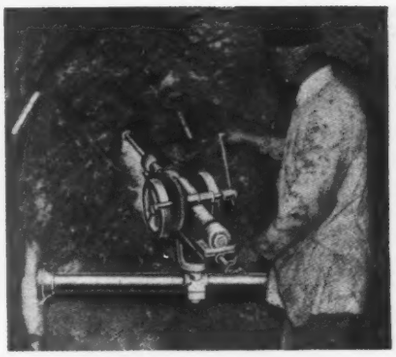

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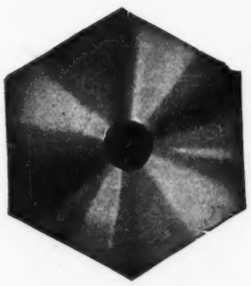

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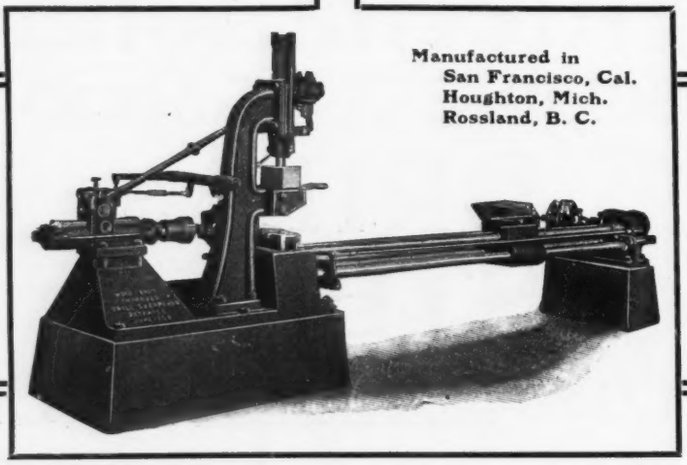
Wheeling, W. Va., 1004 Schmulbach Building.

The PNEUMELECTRIC Machine Company Syracuse, New York

11-25

Madisonville, Ky., Madisonville Savings Bank.
Denver, Colo., 726 Symes Building.
Montreal, Can., 317 Craig Street, West.
Calgary, Alberta, Can., 220 Ninth Ave., West.
St. Petersburg, Russia, Fontanka 53.

The Word Drill Makers And Sharpeners



Manufactured in
San Francisco, Cal.
Houghton, Mich.
Rossland, B. C.

Known Wherever Drills Are Known

We've shipped our machines to all parts of the world—wherever drills are known and used. Men who know have acknowledged them the best on earth. The **Word Drill Maker and Sharpener** has many special features, namely: Is easy on the operator, which means a better class of work, and more of it. Every possible part of the **"Word"** is power-driven, which is cheaper and faster than human muscle. No Chains, Cranks, Ropes or Pilot Wheels to hang onto. It's a solidly built machine from the ground up—the solid foundation is essential to fast and heavy work.

Our illustrated catalog describes more fully the thousand and one other good points contained in the Word Sharpener. Do you want a copy?

Machines in Stock in New York Ready for Immediate Shipment

WORD BROS, 60 Castro Street, SAN FRANCISCO, CAL.
29 BROADWAY, NEW YORK

Repeat Orders Are Common

The Cleveland Rock Drill Co., Central City, Colo.
Cleveland, Ohio. May 6, 1909.

Gentlemen: Please send me via freight, the following drill equipment and charge same to our account.
2 No. 40 stope drills and equipments, chucks to receive 1″ solid cruciform steel per sample sent with first drill.
THE "CLEVELAND" STOPE DRILL which we have of above pattern is perfectly satisfactory, giving perfect service with no interruption.

Very truly yours,
Name gladly given on application.

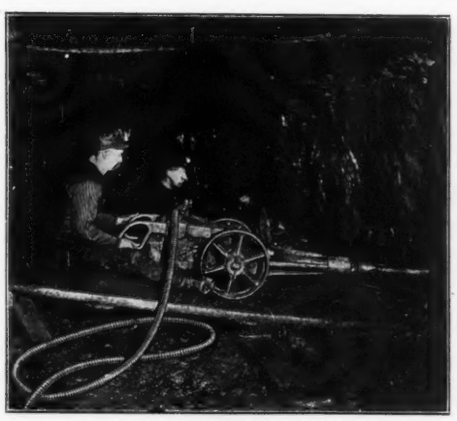
Once our customer, always our customer.
WHY DON'T YOU GET IN LINE?

Bulletin No. 40-A, containing full information, mailed on request.

The Cleveland Rock Drill Co.,

Cleveland, Ohio, U. S. A.

New York, 30 Church St.
Calumet, Mich., H. P. Claussen.
Victor, Colo., E. A. Barnes.
Salt Lake City, Salt Lake Hardware Co.
San Francisco, Hewitt Machinery Co.
El Paso, Texas, Wm. Jennings Co.
Cobalt, Canada, The Canadian-Cleveland Drill Co., Limited.



THE QUESTION

"What is your opinion of the Sprague Flexible Steel Armored Hose?"

THE ANSWER

"It is so durable I will not live long enough to report how long it will last."

Nearly two years later the same man wrote: "The reason why we have not ordered any more hose is owing to the fact that we have not been in need of any."

DOES YOUR HOSE WEAR LIKE THAT?

If you want a durable hose and one that will not burst without warning, get SPRAGUE FLEXIBLE STEEL ARMORED HOSE. Full particulars regarding the unusual qualities of this hose will be cheerfully given. In the meantime write for a copy of descriptive bulletin No. 50732.

SPRAGUE ELECTRIC COMPANY

GENERAL OFFICES: 527-531 WEST 34th STREET, CITY OF NEW YORK

Branch Offices in Principal Cities.

No. 33 Patented. Price, $1.00.

The Light Is Better—The Cost Less

These are use-proved lamps, and experience with them shows that the cost of lighting compared with candles and oil is from *one-half* to *one-third* less. That alone makes the

Baldwin Acetylene Pit Lamp

worth considering. Add to it that even sunlight is not much brighter and you have before you facts that should convince you that this lamp is worth a trial.

Ask us for information.

John Simmons Co., 102 Centre St., New York.

Try A Bar Of "LUG" On Our Say So

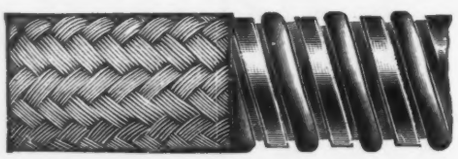
If you are not entirely satisfied with its effectiveness we'll wipe the account off the book and say nothing more about it. Quite fair, isn't it?

Write today for a trial bar and Bulletin No. 2.

Eureka Drill Steel Company,

1416-1418 Wazee Street, Denver, Colorado.

There's Economy In Using Flexible Metal Hose



The *American Metal Hose* combines great strength with durability, and is exceptionally well adapted for highest steam pressures, compressed air, oil, rock drills, pile drivers and a thousand and one other purposes where severe duty rules.

Using Metal hose of the "American" make means long life and economy.

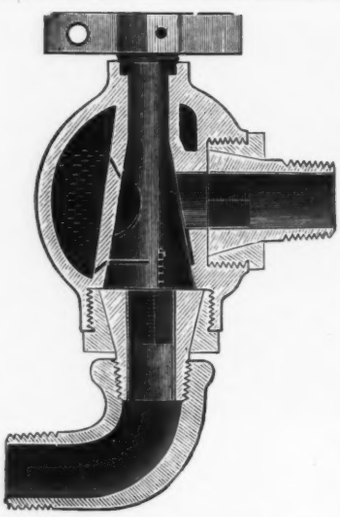
Correspondence invited.

The American Metal Hose Co.

173-177 Lafayette St., New York

Cable Address: Amethose, N. Y.

Once Tried Always Used



Small size $5.00

Large size $7.00

You can't get away from the fact that the *Western Valves* are life savers.

They add materially to the usefulness of your drills and coal punchers and prolong their life. There's no risk in ordering them—there's a money-back guarantee if not as represented.

Write for Catalog No. 2.

The Western Lubricating Valve Co.,

1416-1418 Wazee Street, Denver, Colo.

THE BABCOCK & WILCOX CO.,

CHAS. C. MOORE; PACIFIC COAST MANAGER.

MAIN OFFICE: 99 FIRST STREET, SAN FRANCISCO

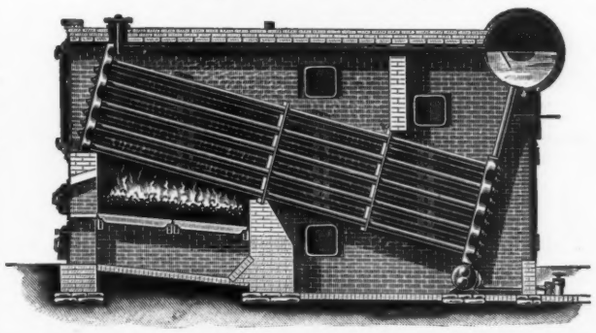
Los Angeles—Trust Building
Seattle—Mutual Life Building
Portland
Wells Fargo Building
Salt Lake City—Atlas Block
New York—Fulton Building

Babcock & Wilcox, Stirling, Rust and Cahall Boilers

For power development in all Mining and Metallurgical operations.

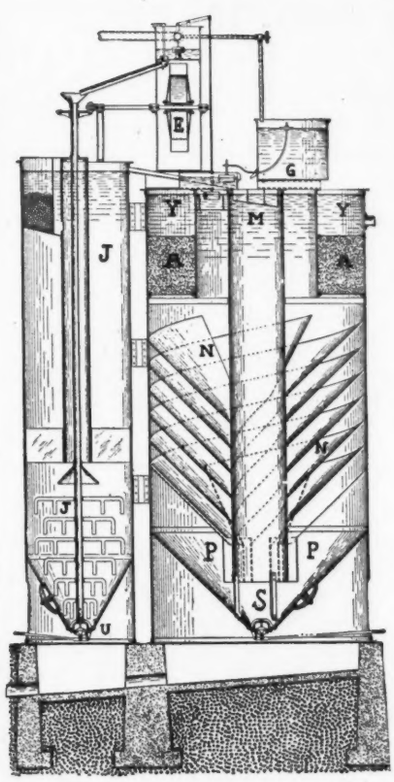
Used by the principal mine operators.

Is your mine difficult of access?



THIS BOILER
can be made
For Muleback Transportation, no part weighing more than 200 pounds.

WRITE FOR PARTICULARS TO OUR NEAREST OFFICE.



DODGE

Your Choice: Scale or No Scale; Which?

If your feed has the scale-forming habit, don't wait until the trouble gets into the heater or boiler before applying the cure. It's too late then. The only sure remedy is to

Remove the Incrusting Solids from the Raw Water

It is then impossible for scale to form in your heaters, boilers, pipes and pumps. Let us convert your hard-water into a soft, non-incrusting supply by installing a

"EUREKA" Water Softener and Purifier

The treated water is ideal for high-class industrial work, such as dyeing, bleaching, general textile manufacture, laundering, etc.

Our literature contains facts and figures that will interest you. Sent free upon request. Coupon here attached is for your convenience. Mail it to-day.

OUR MOTTO: Treat the water *before* it enters the boilers.

Dodge Manufacturing Co.
Sta. F-17, Mishawaka, Ind.

Dodge Mfg. Co.
Station F-17
Mishawaka, Indiana

Gentlemen: Send me your water softener Bulletin W-117.

My name.....

Firm.....

Position.....

City..... State.....

TISCO

"The Lasting Castings"

Tisco Manganese Steel

For

Crusher Parts

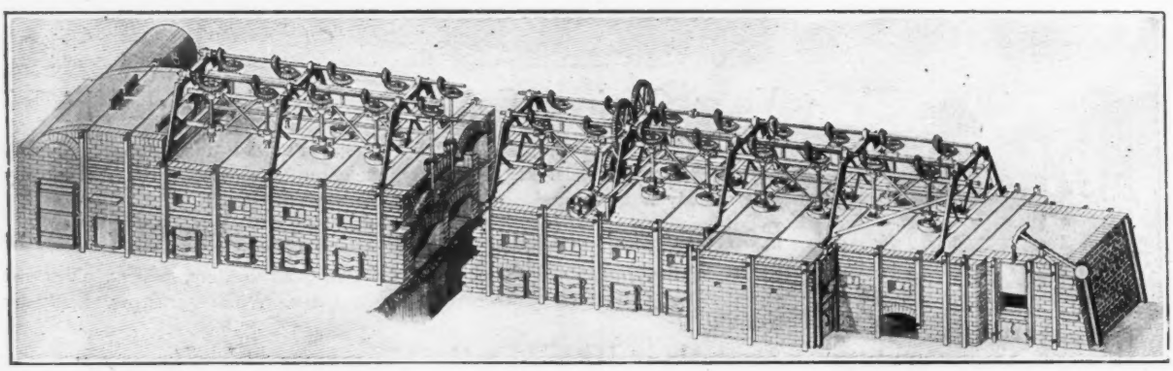
Jaw Plates, Concaves, Cheek Plates,
Heads, Toggle Plates, Chutes

Long Wear

Good Service

Taylor Iron & Steel Co.
High Bridge, New Jersey

Economy In Labor, Fuel And Maintenance.



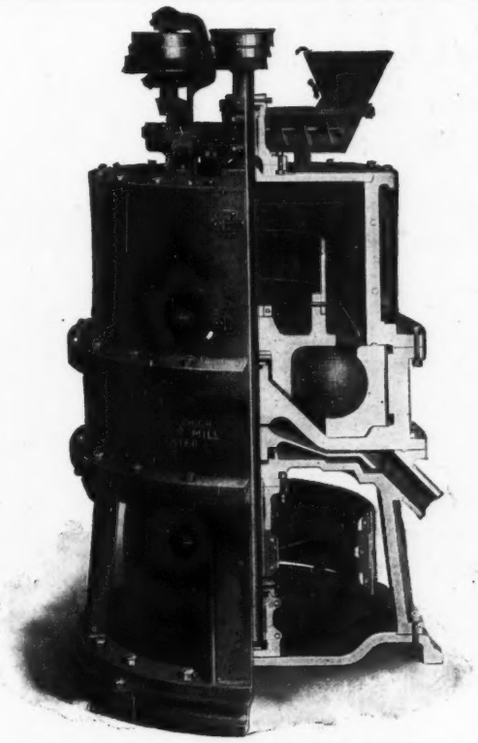
The Edwards Patent Mechanical Ore Roasting Furnace uses no fuel whatever but that to be found in the ore where sulphur obtains in any quantity and less fuel than any other furnaces where there is any sulphur at all.

The "Edwards" has a record for extracting 98% of all the gold in the ore. The mechanism is very simple and requires practically no attention after starting.

It will bear the closest investigation because THERE IS NO OTHER JUST AS GOOD.

Write for descriptive matter and further information.

Chisholm, Matthew & Company, Agents,
Colorado Springs, Colo.
T. EDWARDS, Ballarat, Australia, Patentee and Owner.



The Fuller-Lehigh Mining Mill

Extract All The Values

It delivers a finished product having the highest percentage of mineral available and makes all extraction possible. There is no Pulverizer that can equal in general results the "Fuller-Lehigh."

Unequalled For Fine Grinding

Grinds Wet Or Dry

In one operation and without subsequent screening it takes ¾" material direct from crushers and delivers 4 to 6 tons per hour of 60 to 150 mesh material with an expenditure of less than 65 H.P.

May we send you full particulars?

LEHIGH CAR, WHEEL & AXLE WORKS

MAIN OFFICE, CATASAUQUA, PA.

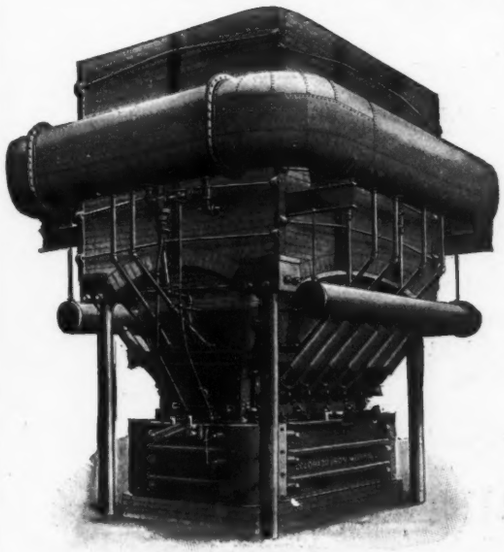
NEW YORK, N. Y.
Fulton Bldg., 50 Church St.

HAMBURG, GERMANY
Alsterdamm 7.

KANSAS CITY, MO.
Scarritt Bldg.

1860 COLORADO IRON WORKS COMPANY 1909

ORE SMELTING EQUIPMENTS — ORE MILLING MACHINERY



Smelting Furnaces

We were pioneers in the building of blast furnaces for smelting copper, lead, silver and gold ores and have made this a specialty for many years. Intimate knowledge of the metallurgical requirements and a sustained effort to excel in this line have caused our productions to stand pre-eminent as the most advanced examples of this class of equipment.

Colorado Iron Works Co.,

Office and Works, 33rd and Wynkoop Sts.,

Denver, Colo., U. S. A.

A Big Lathe

PLUS—the additional capacity of a 26-inch Swing
MINUS—the thousand dollars from the big Lathe's cost
That's

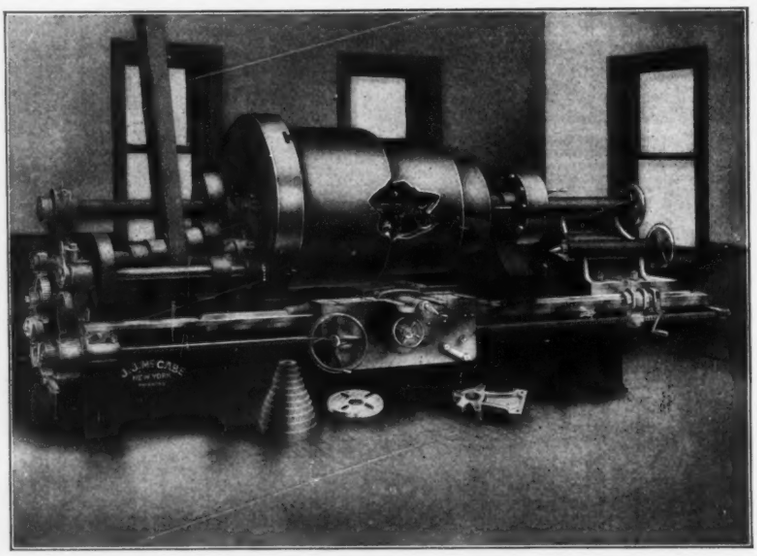
McCABE'S Patented "2-in-1" DOUBLE-SPINDLE LATHE

You have big work today and will have a small job tomorrow.

The "working partnership" of **McCabe's "2-in-1" Lathe** enables you to do everything.

Pause at the price-point and it will emphasize the wisdom of getting **McCabe's "2-in-1" Lathe**—there is no other 48-inch Lathe at less than a thousand dollars more. Prominent mines all over the world have them.

Will we send the book?

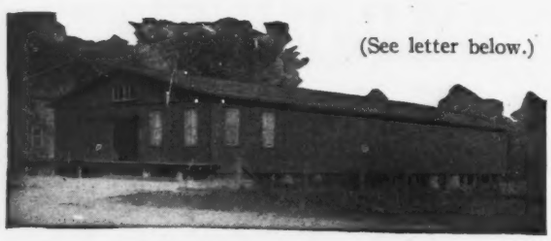


J. J. McCABE

"The Double-Spindle Lathe Man."

30 Church St. NEW YORK CITY

Foreign Agents:
Manning, Maxwell & Moore, Yokohama, Japan



(See letter below.)

Amatite ROOFING

Colchester, Connecticut, September 4, 1908.

BARRETT MANUFACTURING COMPANY:

Dear Sirs: The Amatite Roofing on my own grain store is giving much better service than I could believe it would at such a moderate price. It is by far the cheapest roofing on the market, when you consider the wearing qualities. Am going to use it on my other buildings. (Signed) AMOS C. CASE.

This is a type of hundreds of letters which we get regarding Amatite.

It is better made; has better waterproofing material and weighs more per square foot than any other roofing of the same price.

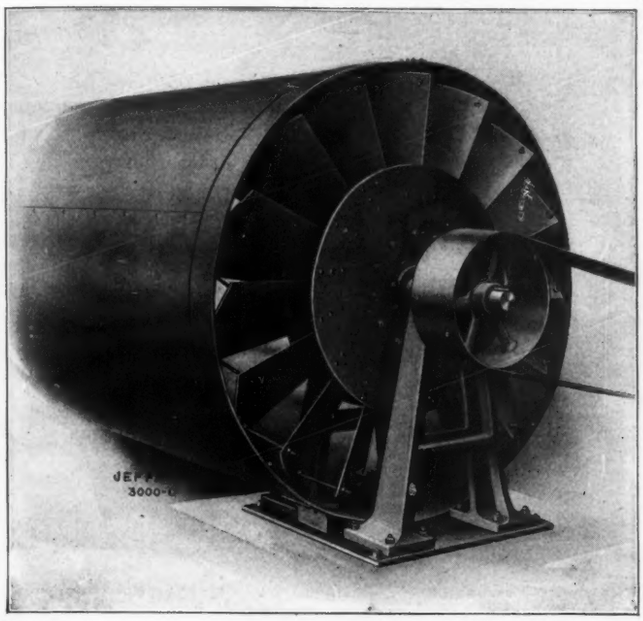
And Amatite has one distinction which makes it stand out above all others—it has a *real mineral surface* which does away entirely with painting.

No other ready roofings compare with it from the standpoints of low cost, no maintenance cost and absolute protection.

Sample and Booklet on request.

BARRETT MANUFACTURING COMPANY,

New York Chicago Philadelphia Boston Cincinnati Minneapolis Cleveland
St. Louis Pittsburg New Orleans Kansas City London, Eng.



JEFFREY PROPELLER FAN FOR MINE VENTILATION

This fan is highly recommended wherever the development does not justify the installation of our centrifugal fan. It has no equal for boosting along feeble currents in large operations.

A DISTINCT IMPROVEMENT OVER THE ORDINARY DISC FAN

It is self contained, simple in operation and embodies many new features which are described in our Bulletin Ra. 23, mailed on request.

WE BUILD COMPLETE COAL MINE EQUIPMENT
INCLUDING
Electric Locomotives, Electric and Air Power Coal Cutters and Drills, Car Hauls, Screens, Tipples, Crushers, Elevating and Conveying Machinery, etc.

THE JEFFREY MFG. CO., COLUMBUS, OHIO

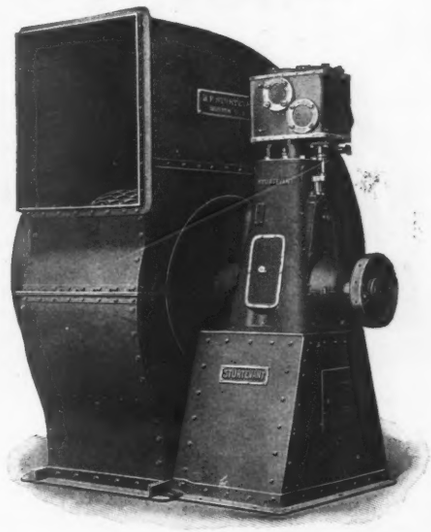
New York Chicago Boston St. Louis Denver Knoxville
Pittsburg Wilkes Barre, Pa, Charleston, W. Va. Buffalo Montreal, Can.

THE STURTEVANT

System of Mechanical Draft

includes the MOST EFFICIENT Commercial Fan in the World.

STURTEVANT ENGINES, either vertical or horizontal, are especially designed for driving the Fan.



B. F. STURTEVANT CO., Boston, Mass.
General Office and Works, Hyde Park, Mass.
NEW YORK PHILADELPHIA CHICAGO CINCINNATI LONDON
Designers and Builders of Heating, Ventilating, Drying and Mechanical Draft Apparatus; Fan Blowers and Exhausters, Rotary Blowers and Exhausters, Steam Engines, Electric Motors and Generating Sets; Pneumatic Separators, Fuel Economizers, Forges, Exhaust Heads, Steam Traps, Steam Turbines, etc. 695

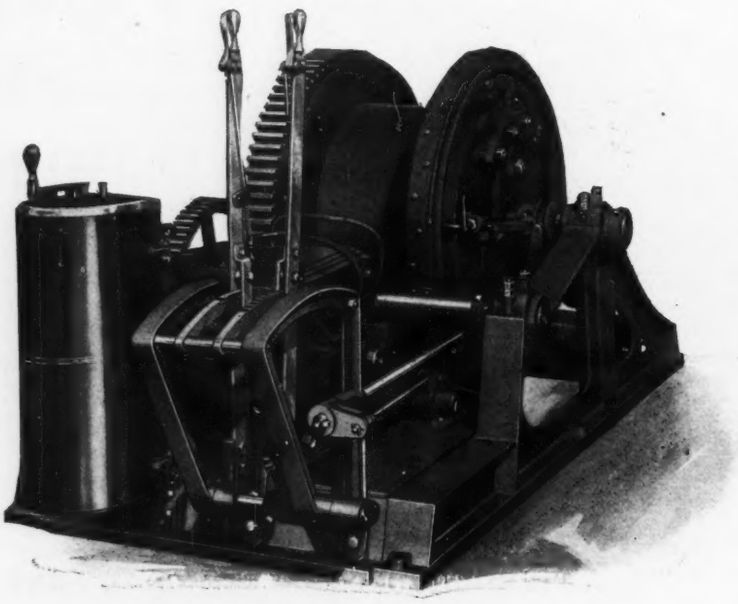
"SAMSON" HOISTS

We show here one of the many types of our "Samson" Hoists.

Whether Steam or Electric, "Samson" Mine Hoists represent strictly up-to-date machines, designed and built throughout for severe service.

Cut Gears, Steel Pinions and Rawhide Motor Pinions are standard with us, not special.

Where in use they are favorites, and there are many hundreds in use.



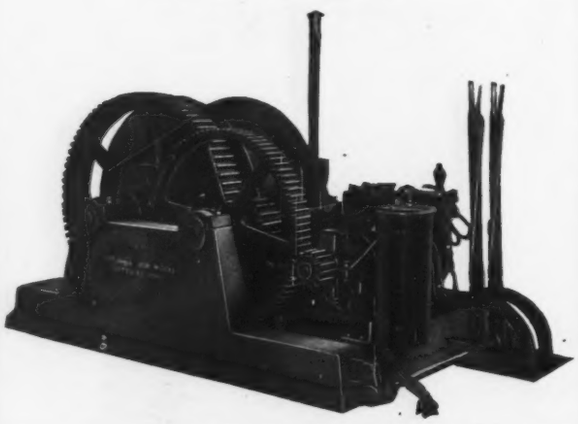
Single Friction Drum Electric Hoist, Direct Current Motor.

THE ENGLISH IRON WORKS COMPANY,

KANSAS CITY, U. S. A.

ASK FOR BULLETINS.

THE NOISELESS HOIST



A well known mine superintendent recently named the Ottumwa Hoist, the "Noiseless," on account of the perfect contact and silent operation.

This attribute is brought about by milled teeth being used on the main gear—a distinctive feature with us.

When installing a hoist, think of the "Ottumwa."

Write for particulars.

OTTUMWA IRON WORKS,

OTTUMWA, IOWA

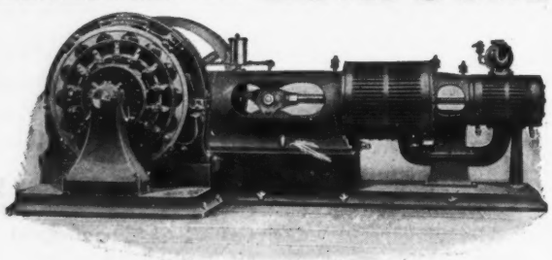
FLORY ENGINES

For Contractors, Pile Driving, Quarry and Mine Duty.

Also tail rope haulage, inclines, slate machinery and suspension cableways. Ask for catalog. Satisfaction guaranteed.

S. FLORY MFG. CO., Bangor, Pa.

SIMPLE OR COMPOUND



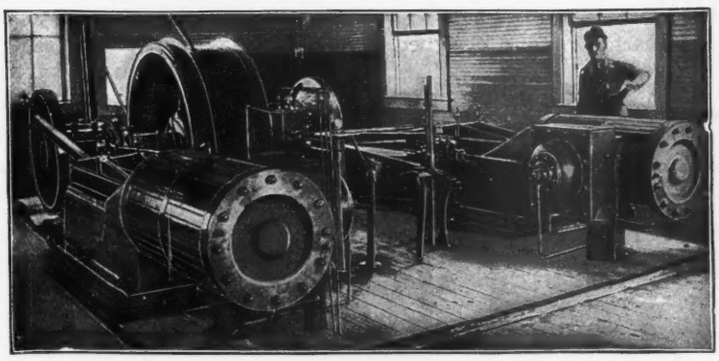
There are no delicate or complicated parts to the "Ridgway" engines. Ridgway Dynamos and Engines are built to work together. *Details? Why certainly! Write for Bulletin.*

RIDGWAY DYNAMO & ENGINE CO., RIDGWAY, PA.

DANVILLE

3,102 Tons In 8 Hours

A short distance record made by the **Danville Hoist.** The "Danville" has hoisted more coal per year than any other hoist made. *That's going some—and more, too.*



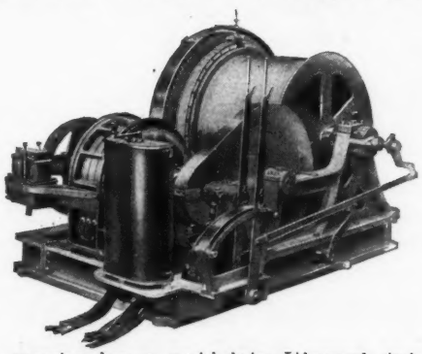
We install complete hoisting equipments on very short notice.

The "Danville" can give you the service you are looking for. *Write your wants.*

DANVILLE FOUNDRY AND MACHINE COMPANY
DANVILLE, ILL., U. S. A.
Denver Representative, Wm. M. Welsh, 506 Bank Block, Denver, Colo.

HOISTING ENGINES

LIDGERWOOD MINE HOISTS
STEAM AND ELECTRIC



The engraving shows a special design Lidgerwood single friction drum Alternating Current Induction Motor Mine Hoist equipped with Solenoid Brake.

It is furnished in sizes from 15 H. P. to 150 H. P. with a hoisting capacity of 1500 lbs. at a speed of 250 ft. per minute to 6500 lbs. at 575 ft. per minute.

The Solenoid Brake is applied to the armature shaft and operates automatically when the current is cut off either by accident or when the hoist is stopped.

All Lidgerwood hoisting engines are built on the duplicate part system and are entirely self-contained.

Over 32,000 Engines and Electric Hoists in use.

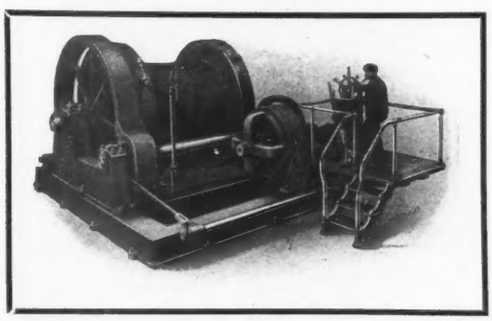
CABLEWAYS, HOISTING AND CONVEYING DEVICES.

Send for Latest Catalog.

LIDGERWOOD MFG. CO., 96 Liberty St., NEW YORK.

Branch Houses: Chicago, Boston, Pittsburg, Philadelphia, Cleveland, Atlanta, Seattle, London, Eng.

VULCAN Mine Hoists



If durability, safety and economical operation count for anything, you need look no further when you think of installing a hoist.

The "Vulcan" is full of every good feature that can be crowded into a hoist. That's the kind you want to install.

Ask us hoist questions—no charge for replies.

Vulcan Iron Works
Wilkes-Barre, Penna.

Mashek Engineering Company

Briquetting Machinery

We have built and equipped more Coal Briquetting Plants than all other Manufacturers combined, and all are a Commercial Success.

Crushing Plants

Complete plants for quartz or stone, designed and erected.

Mining Machinery

Let us figure on your complete installation. We take contracts for complete plants turned over to owners in operation and guaranteed.

Cement Plants

Contracts taken for complete mills.

90 West Street (West Street Bldg.) New York

WE CONTRACT FOR
Complete Plants Erected
OR
Machinery Equipment
F. O. B. CARS

YOUR NEW PLANT
must be correctly designed for your specific requirements to ensure best results. We have had 29 years' successful experience—
An Absolute Guarantee

MILL AND SMELTER ENGINEERING CO.

114-118 Liberty Street NEW YORK Cable Address "Milsmelco"
F. W. HOPKINS, Manager. P. E. VAN SAUN, M. E., Chief Engineer

LET US QUOTE YOU ON..... **MACHINERY, TANKS, SUPPLIES, Etc.**

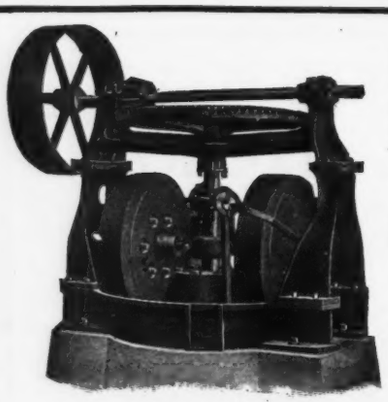
Factories in Pennsylvania and Colorado. We ship from point best suiting your location.
WE WILL SAVE YOU TIME AND MONEY

Here's The Story In A Nutshell

The **Ferraris Ball Mill** pulverizes—screens—returns over-size.

Three special features of this great mill. It will reduce your crushing cost to about one-half of what you've been paying. Worth your immediate investigation if interested in a money saving proposition.

THE
F. M. DAVIS IRON WORKS CO.
Mine, Mill, and Smelter Machinery
DENVER, - - - COLO.



Standard Stationary Pan.

Grinding Pans and Crushers

Thos. Carlin's Sons Co.
Pittsburg, U. S. A.

CONCENTRATION OF LEAN AND IMPURE

IRON ORES

PROCESS FULLY DESCRIBED IN OUR CATALOGS.

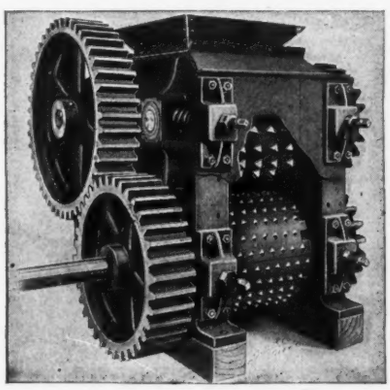
AMERICAN GRÖNDAL KJELLIN CO.,
45 WALL STREET. NEW YORK.

FOOTE MINERAL CO. DEPT. A
107 N. 19TH ST., PHILADELPHIA, PA.

Quality is assured as we permit return of specimens at our expense

We Sell mineral, ore and rock specimens in sets or singly, for assayers, prospectors and experts.
We Buy ton lots or less of rare ores, beautifully colored minerals, or crystals.
Meteorites and **Private Collections** of minerals purchased.
Post Small Samples for free identification.

COMPLETE MINERAL CATALOG. 320 pages, 300 illustrations. Contains name, chemical formula, crystal form, color, etc. of every known mineral: a Classsification of Minerals according to Metal Content, with percentage of metal contained. Semi-flexible cloth, postpaid, $0.50. Flexible leather, interleaved with 320 blank alternate pages for notes on samples, analyses, etc., affords a private mineral record, $1.50. Price refunded against first $10.00 purchase or on return of catalog. Foreign or American stamps accepted.



C. O. BARTLETT AND SNOW CO.
MAKERS OF CLEVELAND, O. U.S.A.
DRYERS ____ CATALOG Nº 16
GRADERS ____ CATALOG Nº 27
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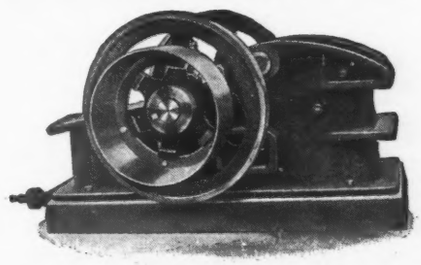

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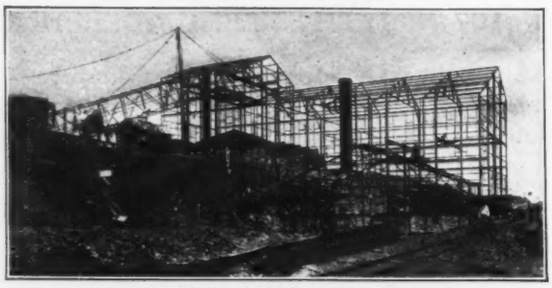

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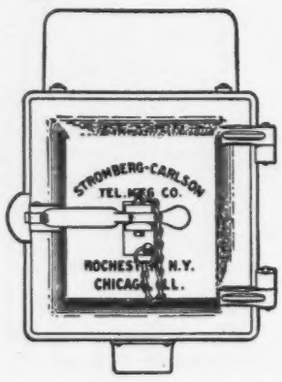

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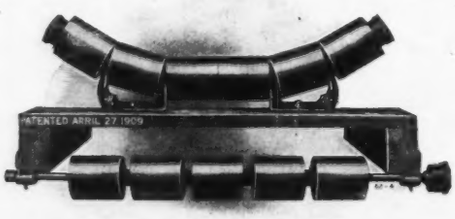

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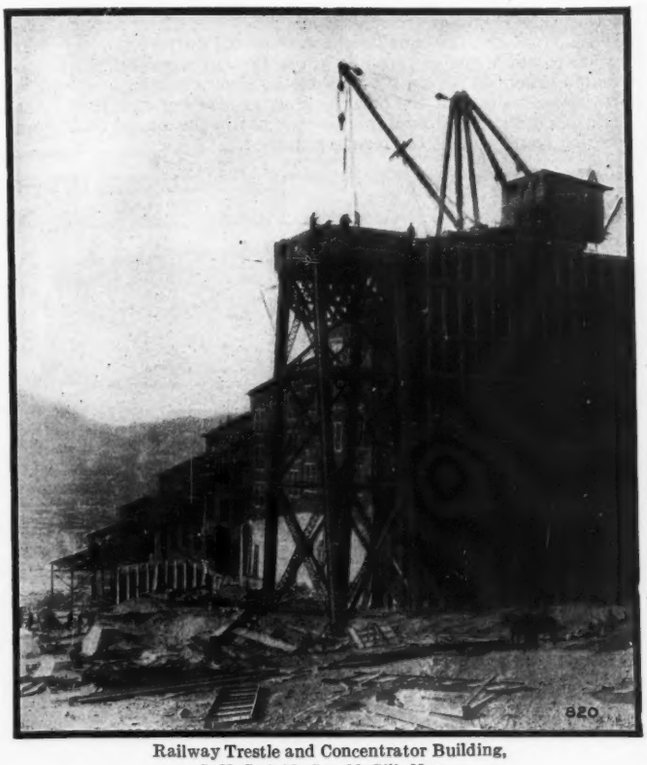

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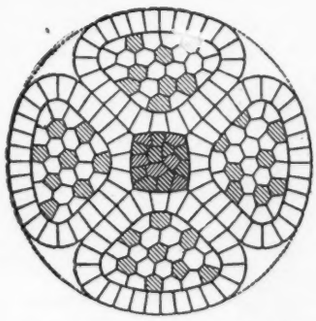

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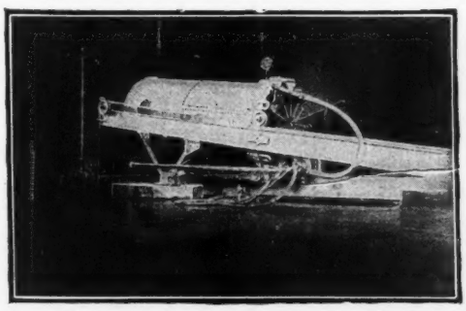
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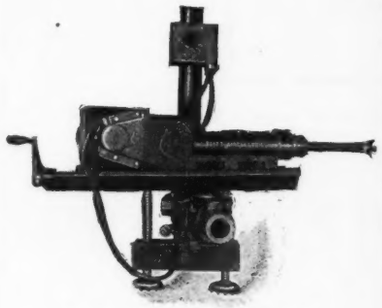
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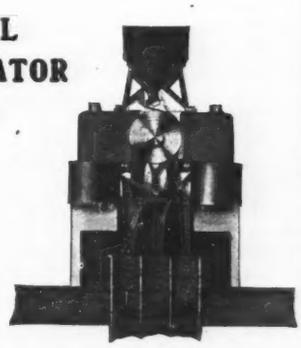

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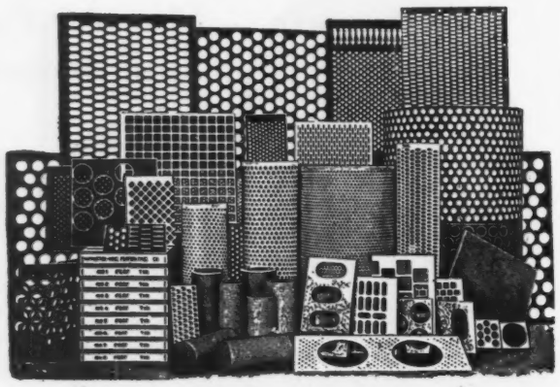

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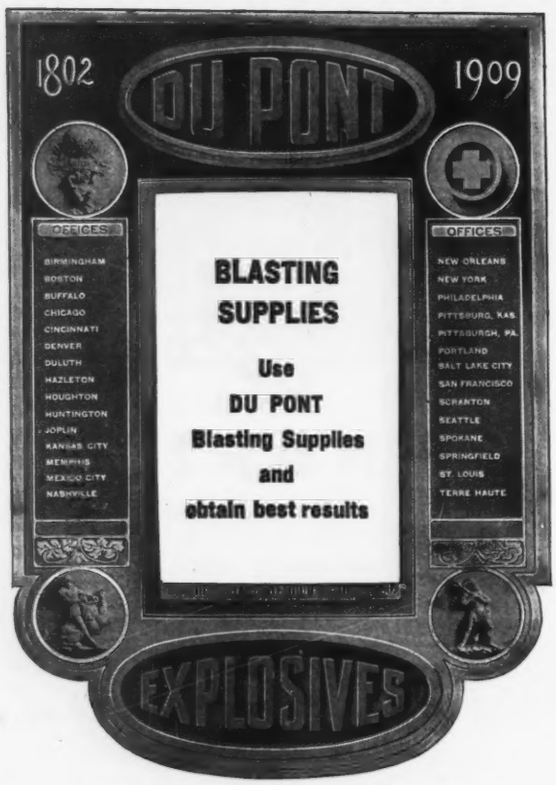

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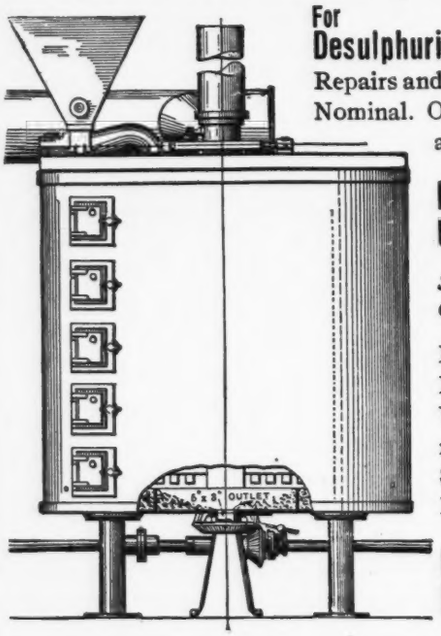

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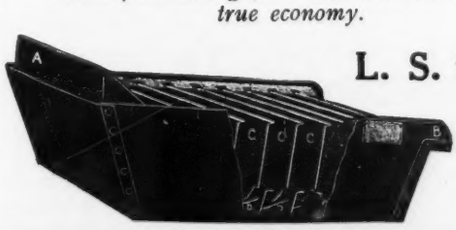

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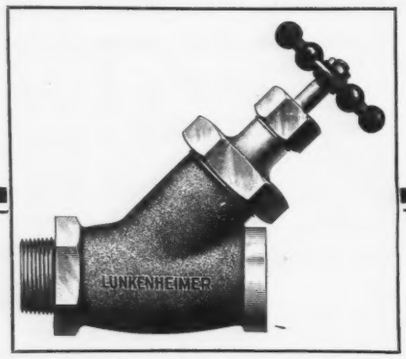

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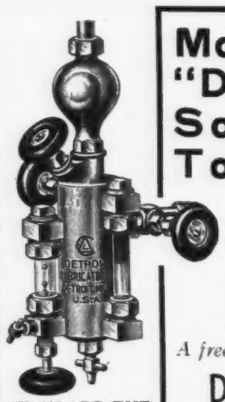

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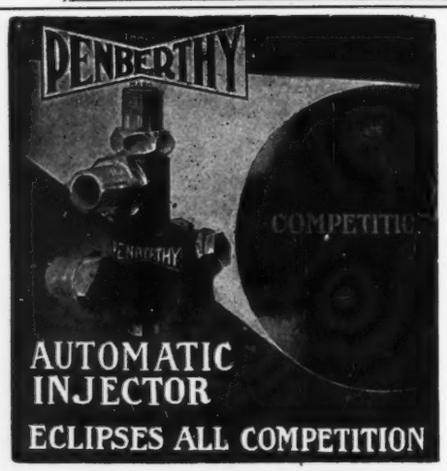

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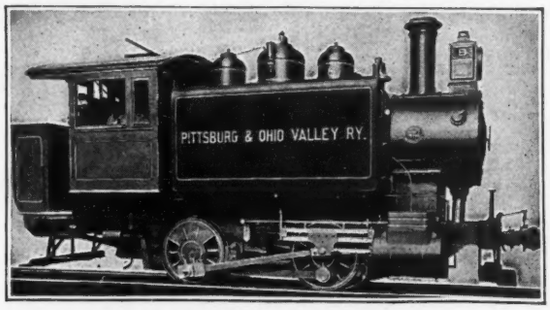

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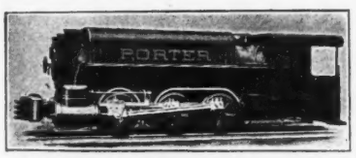

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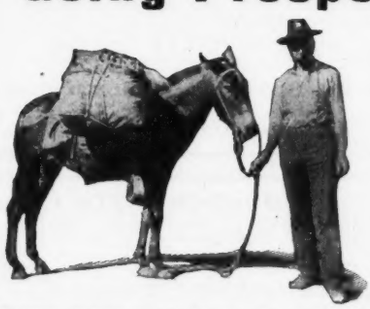

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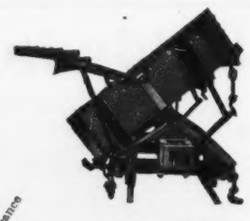
The Unrivalled "K & J" Steam Shovel Car

The Car Of Exclusive Devices For Damage Evasion and Long Wear



Catalog 33-B

It has pivoted doors which are free to swing out if struck by a rock in dumping. All other cars have a lever-raised, rigid door which is apt to snap loose or be damaged.

This patented free door allows the greatest possible dumping clearance between door and floor.

All working parts are of steel, practically no castings being used:—strength—no delay in replacing parts.

Bed secured upon pressed steel channel, arch-braces, which distribute the weight directly over the journals:—wheels held on rails if track is rough. Capacities 1 1-2 to 6 cu. yds.

No. 168

The Kilbourne & Jacobs Manufacturing Company, Columbus, O., New York Office, 25 Broad Street

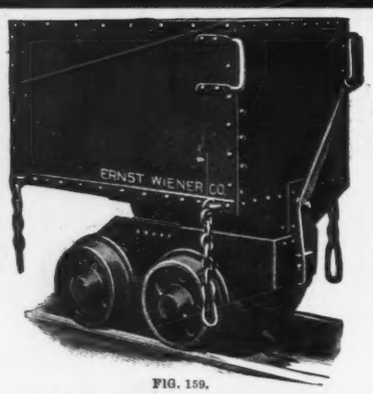


FIG. 159.

This Rotary Dump Mining Car

is made entirely of steel and is equipped with our standard lever unlocking device. As the body of the Car has a 40° dumping angle a clear dump is guaranteed. We build this car for any gauge and capacity.

QUICK DELIVERY.

We can make quick delivery owing to our exceptional facilities of manufacturing and shipping. We constantly carry a *large stock* of Rails, Frogs, Switches, Cars, etc. Our CATALOG 30 shows many types—get it.

Agents for Industrial Locomotives of the Baldwin Loco. Wks.

RAILROAD SPECIALISTS FOR ALL INDUSTRIES.

ERNST WIENER COMPANY

200 Fulton Street, New York, N. Y.

BRANCH OFFICES:
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Boston, 141 Milk St. Denver, Col., Cooper Bldg. Bisbee, Ariz., P. O. Box 597
Pittsburg, Union Bank Bldg Los Angeles, Cal., 106 W. 3d St.
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ONE OF OUR BIG

SPECIALTIES

THEY STAND

THE STRAIN

If you use sheaves we can supply your wants quickly and economically.

Our 8-foot sheaves are built to lead the "strenuous life."

We make everything in mine equipment.

Consult us if in need of anything.

The Mineral Ridge Mfg. Co.

MINERAL RIDGE, OHIO.

The World's Largest Coke Plants

use the Scottdale Larry—hundreds of them are now in successful operation. Look them up and you'll see why they give perfect satisfaction.

Write.

Scottdale Foundry & Machine Co., Scottdale, Pa.

WONHAM-MAGOR CAR & MFG. CO.

Designers and Builders of

MINE AND INDUSTRIAL CARS

Specialists in the design of cars to meet difficult conditions.

30 Church Street, New York

Tip Car with inclining attachment. Ellersile Gas & Coke Co.

"Industrial" Tip Car

(Trade Mark)

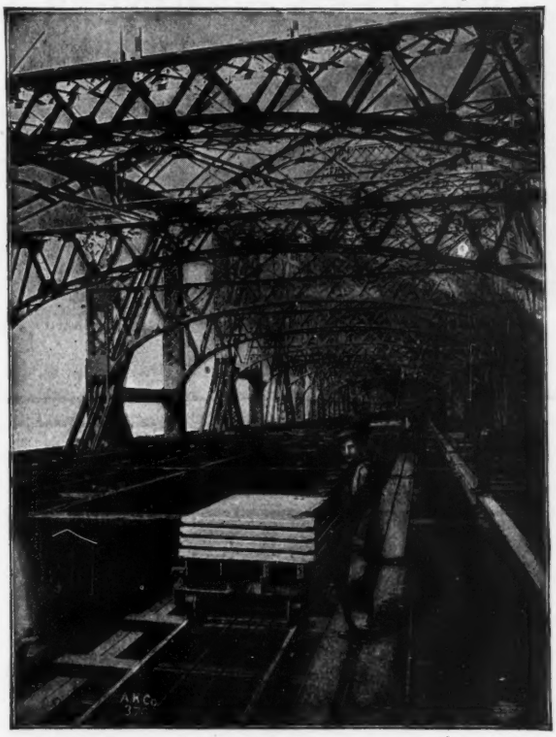
TO HANDLE COAL AND ORE.

The body of the car is hung between the wheels making them about a foot lower than the ordinary tip car, which makes it much easier to load.

Built in six sizes: 12, 16, 20, 27, 36 and 40 cubic feet capacity. Kept in stock ready for immediate delivery. Write for Bulletin 7-A.

C. W. HUNT COMPANY

West New Brighton, New York
New York Office: 45 Broadway



KOPPEL CARS in Construction Work

Koppel Steel Cars and Portable Track solve the problem of economical transportation of earth, building materials, finished products—or anything else that requires hauling. They take the place of wheelbarrows, scrapers, etc., and do more work with less labor and at less expense.

The illustration shows the use of KOPPEL PLATFORM CARS and PORTABLE TRACK in the construction of the new Blackwell Island Bridge, New York.

Write for Catalogue showing how Koppel Equipment can save you maney.

Arthur Koppel Company

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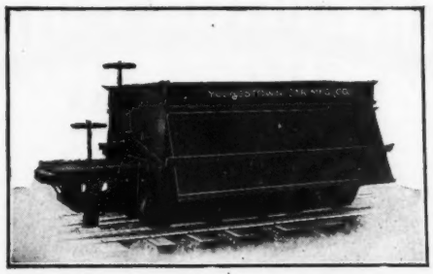
WORKS AT KOPPEL, PA.



CARS

We *specialize* in cars. Think what that means to you. It means that our years of experience, our large designing and engineering force, our immense shop facilities are all *yours* for the asking.

It means that the best brains in the country are working for you, from the day your inquiry is received till the last rivet is driven. It means that when you purchase "Youngstown" cars, you get the best that money can buy.

The Youngstown Car Mfg. Co.

General Offices and Works

Youngstown, Ohio, U. S. A.

New York 90 West Street | Pittsburg Stevenson Annex | Chicago 505 Fisher Building

WATT CARS

"The Cars with a Reputation to Maintain"

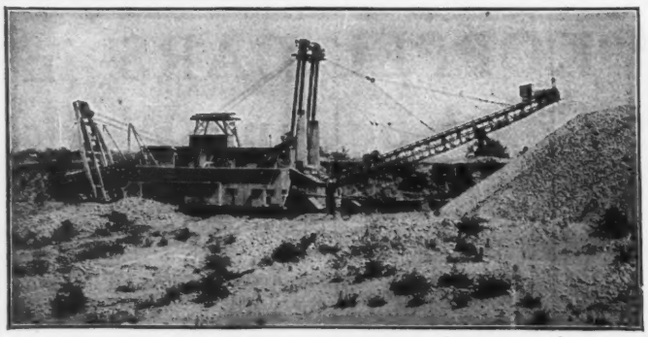
Gold Medal, St. Louis 1904.
Gold Medal, Chicago 1893.

Our long experience guarantees you a minimum trouble and repair expense and that your cars will be as good as you can secure.

Our regard for our reputation as steel car builders guarantees that if there is anything wrong you will have no trouble in getting it made right.

The Watt Mining Car Wheel Co.,

Barnesville, Ohio.



Folsom No. 6—8¼ cubic foot Dredge—Equipped with new type double-bank gold-saving tables and hydraulic monitors—Successfully handling the hardest ground known to the dredging industry, 75 feet deep, and treating 150,000 cubic yards per month.

WESTERN ENGINEERING & CONSTRUCTION CO.

CONSULTING ENGINEERS AND CONSTRUCTORS OF

GOLD DREDGES

COMPLETELY EQUIPPED AND READY FOR OPERATION.

SPECIALTY: HULL CONSTRUCTION AND DREDGE MACHINERY INSTALLATION.

AGENTS ROBINS CONVEYING BELT COMPANY, NEW YORK.

733-743 Monadnock Bldg., San Francisco, U. S. A.

THE United States Government recommends the Empire Hand Drill for Alaska, in its report on the "Mineral Resources of Alaska;" Bulletin No. 345-A. The Empire Drill works easier, cheaper, quicker, and more accurately than any other type of drill. Write for our new booklet No. 8 on Drills, and also for our catalog on Gold Dredges.

New York Engineering Co.,

2 Rector Street, New York.

Hayward Buckets

are known and extensively used wherever digging and dredging is carried on. In this country as well as in foreign parts; the "Hayward" always responds to duty and gives most excellent results under the most trying conditions.

For Digging and Dredging

We make a large variety of buckets for every digging and dredging purpose. We've studied well the problems of this vast industry and have the machinery necessary to handle it successfully. Tell us your needs and we will tell you how to meet them in the most economical way.

Our New Catalog awaits your address.

May we have it?

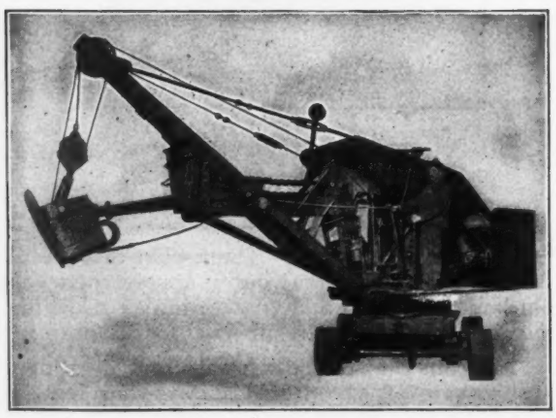
THE HAYWARD COMPANY,

50 CHURCH STREET, NEW YORK.

THE THEW AUTOMATIC SHOVEL Co.

Shovel Points

Number 4.



The Thew Shovel represents the greatest improvements in shovel construction on the market today. It's ease, economy and speed of operation are proven facts. Can be operated by one man. Swings through complete circle. Shovel can load or unload in any position.

The unusual care exercised in the design, workmanship and selection of material, gives the Thew Shovel a freedom from annoying delays, necessitated by repairs, which characterize it as the most reliable shovel on the market.

Send for Catalog.

Lorain, Ohio, U.S.A.

WIRE ROPE HOIST STEAM SHOVEL

Direct wire rope hoist with but one sheave, instead of chain hoist with from five to seven sheaves, reduces delays and loss of time due to breakdowns, increases the efficiency of the engines, and reduces repair bills as well as fuel consumption.

Our pamphlet No. 10029 gives full description. Write for a copy.

Finished and interchangeable spare parts always on hand at works and in Chicago warehouse.

ATLANTIC EQUIPMENT COMPANY

RAILWAY EXCHANGE, CHICAGO. 30 CHURCH STREET, NEW YORK.

N. B. LIVERMORE & Co., Agents, Salt Lake City, San Francisco, Seattle.

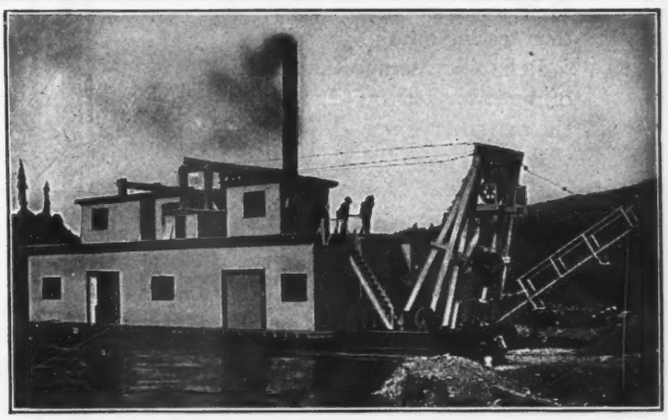
We Built The Dredge
Of Which All Others Are Copies

but the best Risdon features are the patented devices which cannot be copied. Investigate thoroughly before you place your order.

Write for Catalog 17

RISDON IRON WORKS

272 Steuart St., SAN FRANCISCO, CALIFORNIA



MONEL METAL

THE NATURAL ALLOY OF NICKEL and COPPER

NON-CORROSIVE AND STRONGER THAN STEEL

SPECIALLY ADAPTED FOR ROOFS, SKY-LIGHTS, VENTILATORS, ETC., OF SHOPS, SMELTERS, GAS-HOUSES, ROUND-HOUSES, RAILROAD DEPOTS, AND ANY PLACE WHERE A NON-CORROSIVE METAL IS OF PARAMOUNT IMPORTANCE.

THE ORFORD COPPER CO
NICKEL REFINERS
43 EXCHANGE PLACE, NEW YORK.

THE BROWN HOISTING MACHINERY COMPANY

SOME OF THE BROWNHOIST LOCOMOTIVE CRANES FINEST FEATURES.

1. Low first cost.
2. Quick installation.
3. Small yard Space.
4. Operation on standard tracks.
5. Low cost of operation and repairs.
6. Especial efficiency in handling ore.
7. Adaptability to great variety of work.

CIRCULAR "W."

MAIN OFFICE AND WORKS,
CLEVELAND, OHIO
Branch Offices: New York and Pittsburg

4000 MILES FROM AMPERE,

Induction Motor, 15 to 200 H. P.
See Bulletin 88 P.

C-W motors are as reliable as in our own testing-pit.

Reliability is important to the buyer of motors. It is quite as important to the manufacturer.

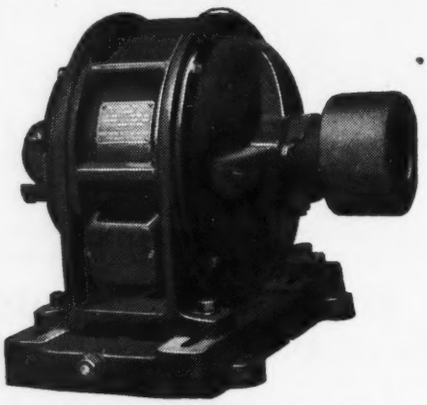
For 20 years we have based our business on reliability.

CROCKER-WHEELER
COMPANY,
Alternating and Direct Current Machinery,
Ampere, N. J., Chicago, Denver, Etc.

FORT WAYNE

75 Induction Motors

like this, ranging from 2 to 20 H.P., furnish the power for one of the most up-to-date manufacturing plants in the country. They save money every day. "There's a reason."



Fort Wayne Type M Induction Motor.

Three Years In Operation

with no cost for repairs. Fort Wayne Motors are durable and reliable. Our new Bulletin No. E1111 shows some successful installations.

ASK FOR IT. 758

Fort Wayne Electric Works

Main Office: Fort Wayne, Ind. Factories: Fort Wayne, Ind., and Madison, Wis.

Sales Offices

Atlanta, Boston, Chicago, Cincinnati, Grand Rapids, Madison, Milwaukee, New Orleans, New York, Philadelphia, Pittsburg, San Francisco, Seattle, St. Louis, St. Paul, Syracuse

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Mill Motors

From 25 to 150 H. P. 110, 220 and 500 Volts D. C.
220, 440 and 550 Volts A. C.

Where absolute certainty of service is desired, these motors are invaluable.

Particularly adapted for rolling mills, hoists, and conveying machinery.

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Principal Office: Schenectady, N. Y.
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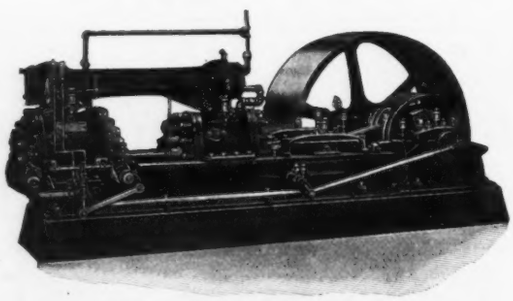
Sales offices in all large cities.

WHY DO YOU SUFFER the disadvantages and endure the risks of old pattern machines when you can get



AUTOMATIC SELECTIVE PROPORTIONAL UNLOADERS

It regulates itself.

It picks out that degree of unloading necessary to keep the air pressure uniform.

Unloads both stages of a compound compressor in same proportion, thus preserving at all degrees of load the proper division of work in the air cylinders.

Not a Squeeze-Off or By-Pass, but an entire dropping of load, running light and free, with no fuze-blowing or belt-breaking labor in resuming work.

Upon the Norwalk Compound Power-driven Compressors.

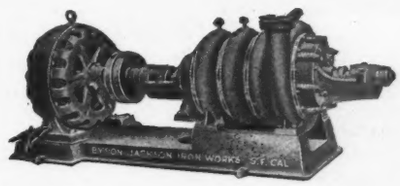
SAFE — RELIABLE — EFFICIENT — ECONOMICAL
24-Hour Daily Service.

The Norwalk Iron Works Co.
South Norwalk, Conn.

The Jackson Electric Driven Turbine Station Pump

Wherever mining is carried on, there you will find the **Jackson Mine Pump** in evidence and doing *more* than its share of work.

It is known for its efficient working qualities and as a pump of standard excellence.



The **Jackson Turbine Station Pump** with outboard bearings is the most rugged, economically operated and the highest in efficiency.

We fully guarantee this pump as to workmanship, quantity of water delivered and general effectiveness.

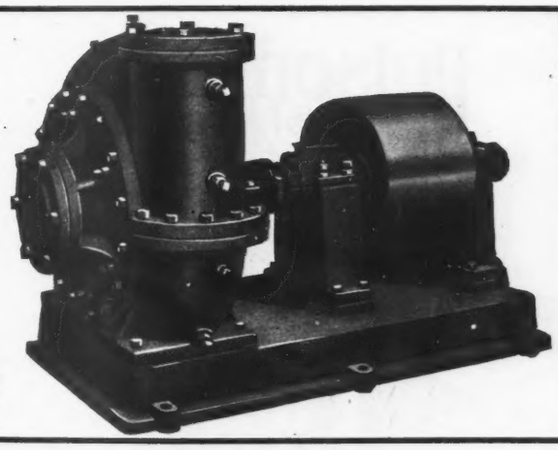
Write for details.

Byron Jackson Iron Works, Inc., San Francisco, Cal.

Los Angeles, Cal. Portland, Ore. Spokane and Seattle,, Wash.

DO YOU PUMP?

Morris Centrifugals are made for all kinds of service. They are far more effective and economical than any reciprocating steam pumps The one shown here has pulley for belt drive with steam engine directly connected for low heads. Let us send you the catalog.



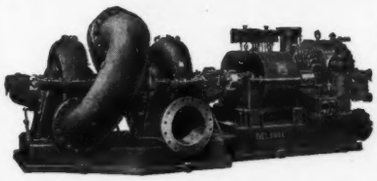
MORRIS MACHINE WORKS,

BALDWINSVILLE, N. Y., U. S. A.

CHARLOTTE, N. C. NEW YORK, 39-41 CORTLANDT ST.

Henion & Hubbell, Agents, 61-69 N. Jefferson St., Chicago, Ill. Harron, Rickard & McCone, Agents, San Francisco and Los Angeles. Cameron & Barkley Co., Agents, Charleston, S. C., and Tampa, Fla. Harris Pump and Supply Co., Pittsburgh, Pa. Hallidie Machinery Co., Agents, Seattle and Spokane, Wash.

LOW PRESSURE TURBINES



5 to 500 brake horse power capacity, 600 to 2400 R.P.M. For utilizing waste steam for the generation of power.

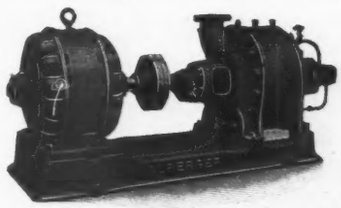
Capacity of non-condensing engine plants practically doubled without increased boiler capacity or coal consumption.

Suitable for all classes of work such as driving machinery by belts or ropes, direct connection to generators, pumps, blowers, etc.

SEND FOR CATALOG No. 49.

De Laval Steam Turbine Co., Trenton, N. J.

Alberger Mine Pumps



will serve you well, especially when service is most needed. They've never been known to fail.

We'll gladly submit estimates at any time. No time like the present—are you ready?

ALBERGER PUMP COMPANY,

205 LaSalle Street, Chicago, Ill. 95 Liberty Street, NEW YORK. 1417-18 Chemical Bldg. St. Louis, Mo.

Frenier's Spiral Pump

The most durable pump for elevating

TAILINGS, SLIMES, BATTERY SANDS, ETC.

NO VALVES NO BUCKETS

FRENIER & SON, Rutland, Vt.

AGENTS—Allis-Chalmers Co., Chicago, Ill. Strauss-Roger Mfg. Co., Denver, Col. Harron, Rickard & McCone, San Francisco, California.

For Mine Work

For mine work our Triple Expansion Mine Pumps give excellent satisfaction. From an economical standpoint, they excel all other makes.

Our Catalog gives you interesting facts concerning our pumps. Write for it.

EPPING-CARPENTER CO.

PITTSBURG, PA.

R. D. WOOD & CO.

400 Chestnut Street, Philadelphia, Pa.

CENTRIFUGAL PUMPS

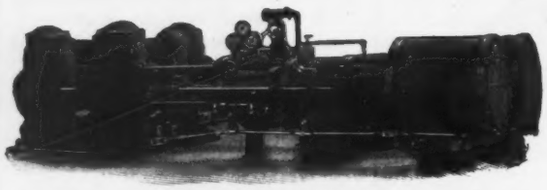
For Mines and Sinking Purposes

GRAVEL and WATER PUMP

For Placer Mining a Specialty

CIRCULATING PUMP

PRESCOTT---*Headquarters for Mine Pumps*---WHY?



Catalogue 20-B "Shows-us-up" write for copy.

DISTRICT SALES OFFICES:
El Paso, Texas, City National Bank Building.
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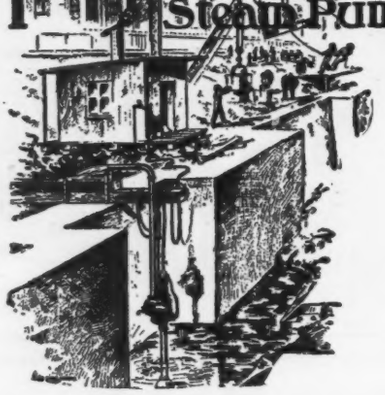
Prescott Builds the **Largest** Mine Pumps.
" Builds the most **Extensive** Line of Mine Pumps.
" Builds the most **Efficient** Mine Pumps.
" Meets the most **Difficult Problems** of Mine Pumping.
" Builds the **Best** Mine Pump.

Fred. M. Prescott Steam Pump Co.
MILWAUKEE, WISCONSIN 53

Pulsometer Steam Pump



THE EASIEST WAY

to drain shallow mines, flooded galleries, elevating water from one level to another, raise tailings, etc., is to install a

PULSOMETER STEAM PUMP

No engine, belt, oil, packing or special foundation required; just a steam pipe from boiler—that's all. Works as well suspended as stationary. May be raised and lowered and swung about without interrupting its work.

Illustrated, Descriptive Catalogue Gratis

Pulsometer Steam Pump Co.
15 Battery Place, New York
Chicago Office; 63-69 No. Jefferson Street

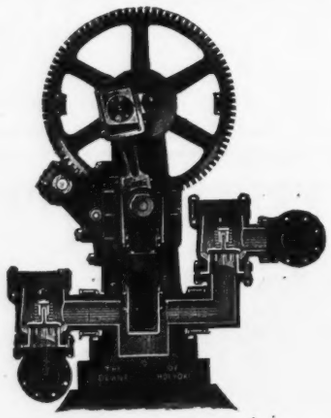
For Pumping water in mines where there is more or less acid in the water, we have designed

The Deane Triplex Single Acting, Wood Lined Pump

as illustrated herewith.

Prices and information furnished upon application.

Send for Bulletin D-43 E. M.

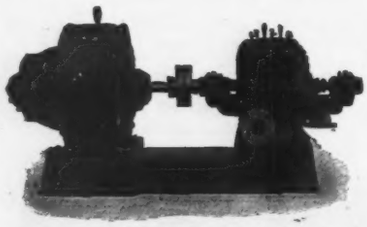


MANUFACTURED BY

The Deane Steam Pump Co.,
Works, Holyoke, Massachusetts, U.S.A.

Boston	New York	Philadelphia	Chicago	St. Louis
42 Batterymarch St.	115 Broadway.	724 Arch St.	770 Old Colony.	605 Chemical Bldg.

D'Olier Turbine Pumps



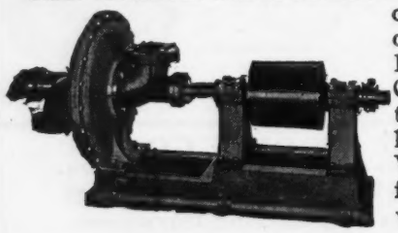
Split Case permits ready inspection of working parts.

Catalogue T. M.

D'Olier Engineering Company,
PHILADELPHIA, 121 South 11th Street,
NEW YORK 116 Liberty Street. PITTSBURG, Union Bank Building.

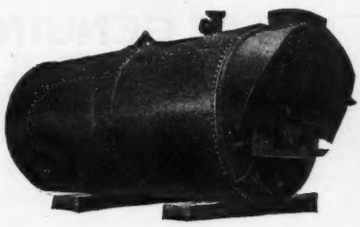
TURBINE PUMPS

Built vertical as well as horizontal. For any style of Drive. Single or Multi-Stage. Iron or Brass. Capacities, 5,000 to 5,000,000 gallons per hour. Very desirable for Mine Service.



ASK FOR PARTICULARS.

ERIE PUMP AND ENGINE CO.
ERIE, PA.



Immediate Delivery.

THE BOILER OF MERIT.

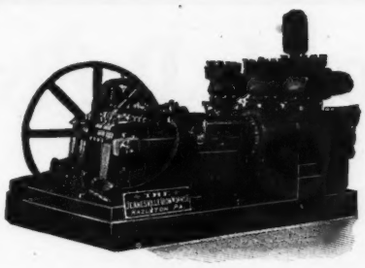
If you contemplate purchasing a boiler, write us. We will tell you something.

"Pumps that Pump"

Centrifugal AND Turbine (THE KINGSFORD KIND)

See the Book.

Kingsford Foundry and Machine Works,
Second and Erie Sts., Oswego, N. Y., - U. S. A.



Write For Information Today

Jeanesville Electric Pumps

For Mining Service Are In A Distinct Class By Themselves — Because

All parts are accessible.
Shafts have bearings between each two cranks.
All bearings are adjustable.
The highest efficiencies are guaranteed.
Our heavy construction is used throughout.
The construction is simple—no experts required to keep machine in order.

Jeanesville Iron Works Co., Hazleton, Penna., U.S.A.

DEMING TRIPLEX MINE PUMPS

Adapted for Any Power

Fig. 61.

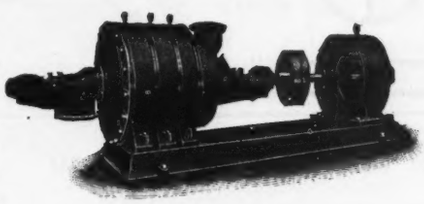
Built in Four Types and Any Sizes

Hendrie & Bolthoff M. & S.Co.,Denver. Henshaw, Bulkley & Co., San Francisco. Harris Pump & Supply Co., Pittsburg. Henion & Hubbell, Chicago. W. P. Dalletl, Philadelphia. Chas. J. Jager Co., Boston. Ralph B. Carter Co., New York. L. Booth & Sons, Los Angeles. English Iron Works Co., Kansas City.

The DEMING COMPANY, Salem, Ohio.

TURBINE PUMPS
FOR HIGH LIFTS

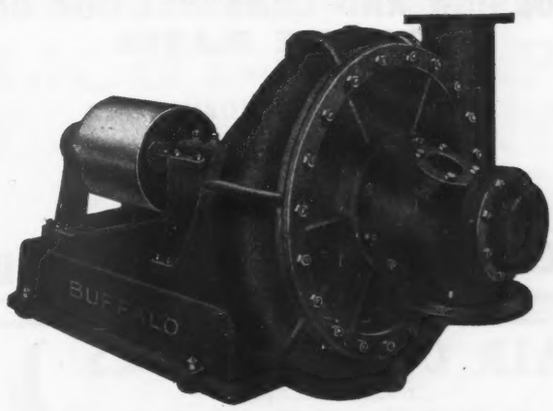
Fitted with Automatic Balancing Device—No Thrust or Roller Bearings Used—All Sizes.



Bulletin M-22

KROGH PUMP MANUFACTURING CO.
133 Beale St., San Francisco.

BUFFALO PUMPS
STEAM - POWER - CENTRIFUGAL



As are turbine pumps to plunger or piston pumps, so is our belted centrifugal pump to the ordinary low service centrifugal pumps. They give excellent efficiencies at any head up to 150 feet and can be used for varying requirements.

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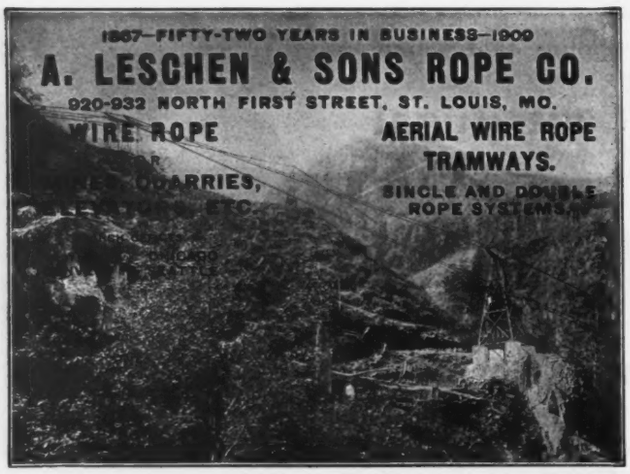

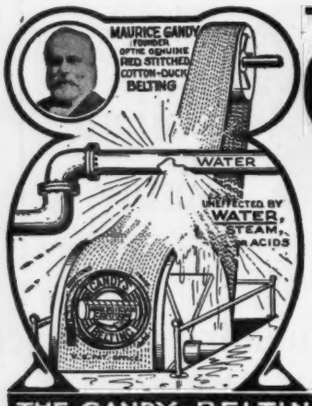

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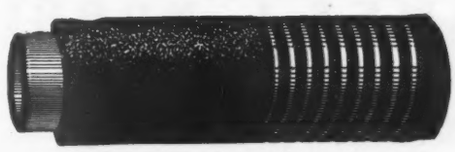

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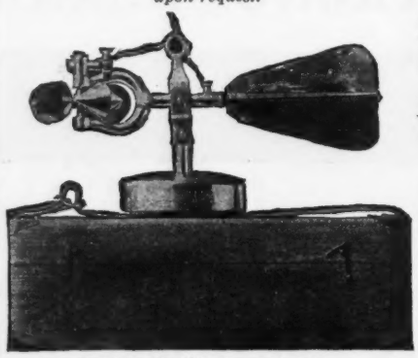

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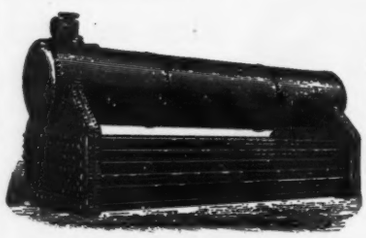

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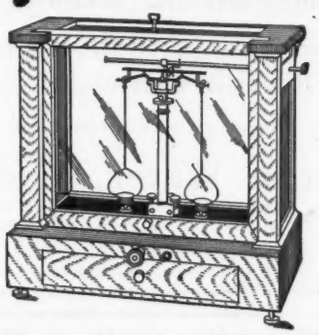

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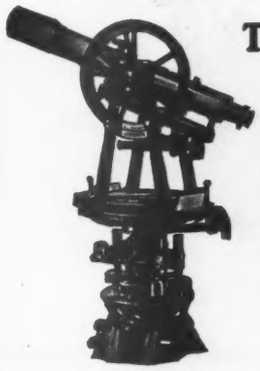

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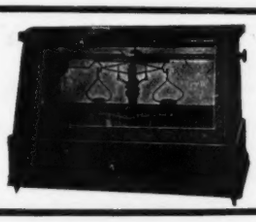

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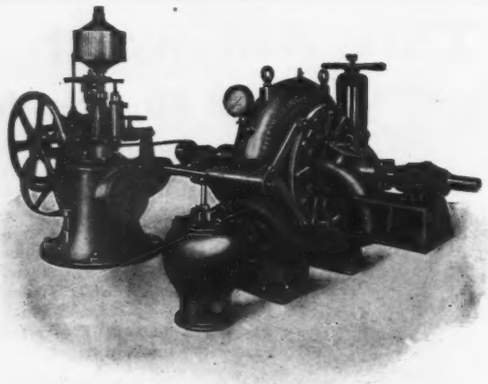

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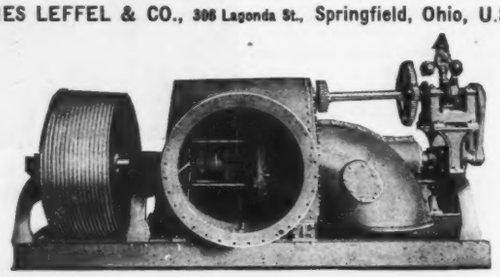

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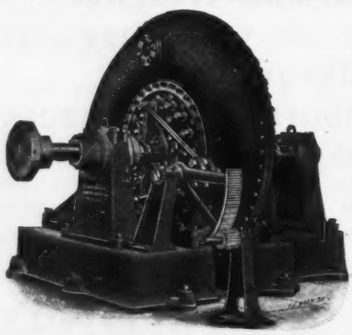

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Mining engineer, graduate, 33, single, is open for engagement. Successful experience as superintendent and manager of important properties, in conducting development, mining and treatment of ores; cyanidation of gold and silver a specialty; fully understands details of organization and administration. South America or Mexico preferred. Speaks Spanish fluently. Highest references. Address "Solid," care ENGINEERING AND MINING JOURNAL. No. 632, June 26.

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Mining Engineer—Technical graduate. Eight years' practical experience in various states in Mexico; desires position as superintendent of mine in Mexico. Speak Spanish fluently; unmarried. Experienced in handling native labor and in construction and operation of mills and in the management of Mines in Mexico. Address "M. H. B.," ENGINEERING AND MINING JOURNAL. No. 656, July 31.

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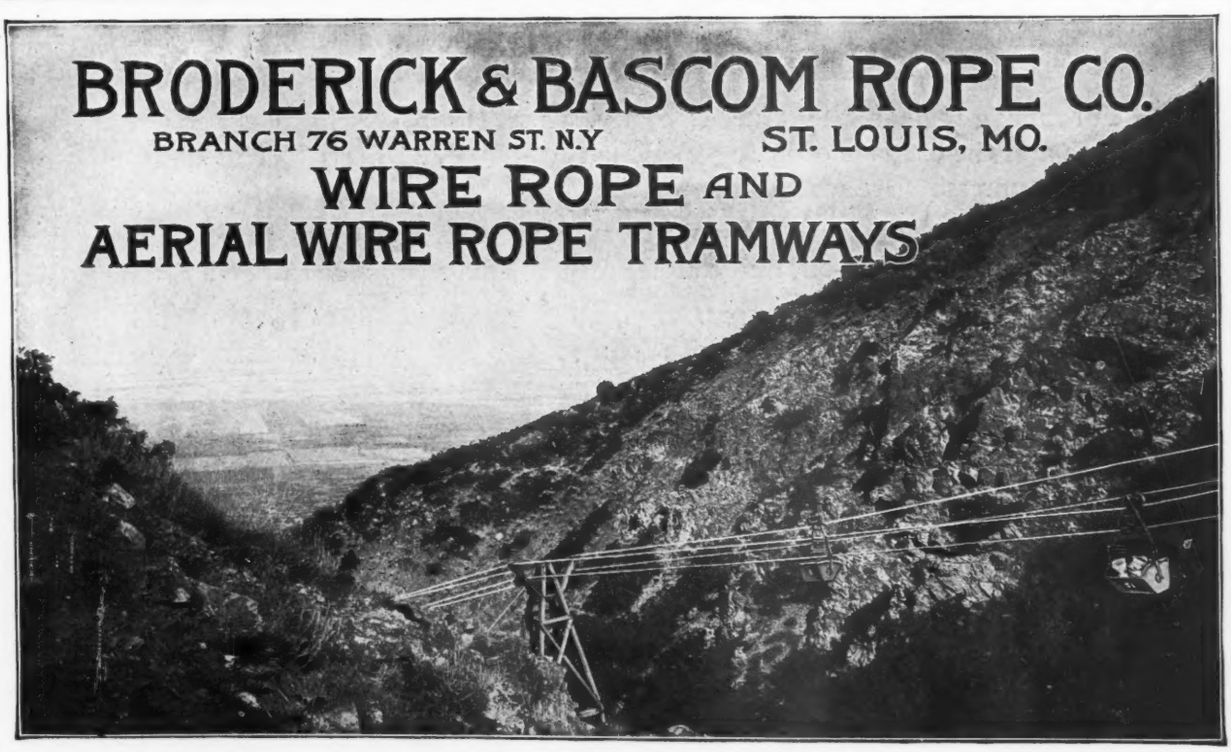

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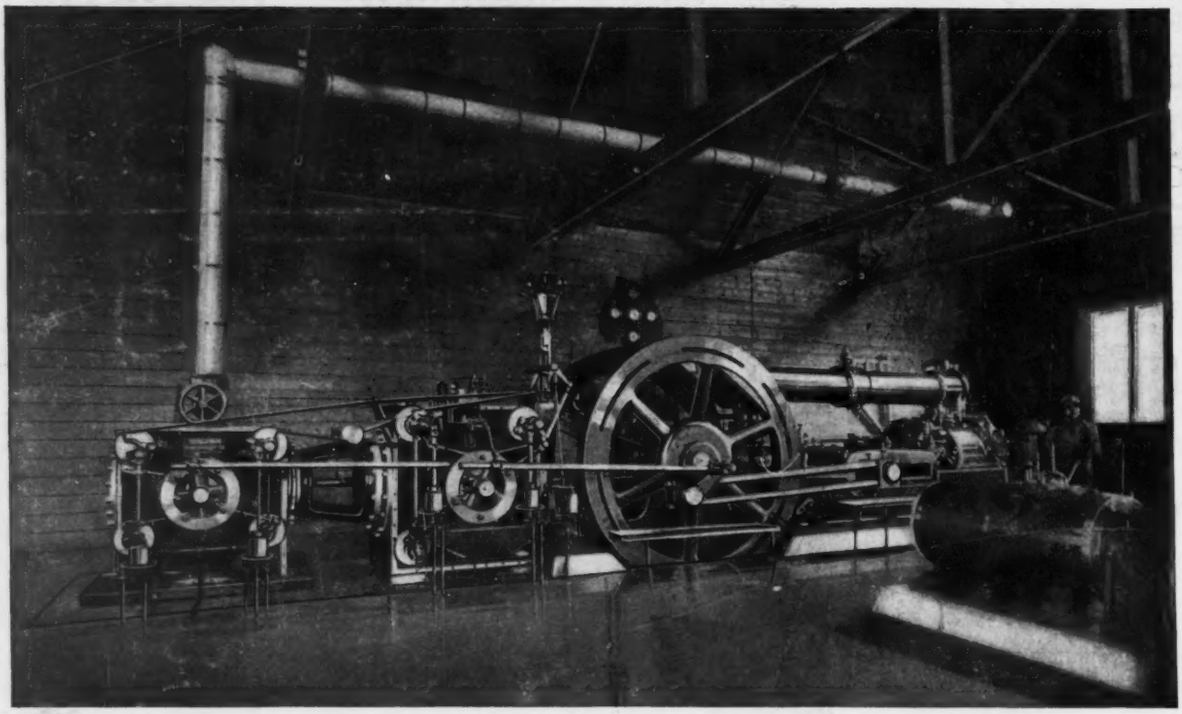

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